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A Comparison of Nursing Students in Problem-Based Learning and the Lecture Method

By

Mila G. Newman

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of

Master of Education

in

Adult and Higher Education

Department of Educational Policy Studies

Edmonton, Alberta

Spring 1995

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DEGREE Master of Education

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Address: 3011 - 105 Street
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Date April 19, 1995

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled

A Comparison of Nursing Students in Problem-Based Learning and the Lecture Method

submitted by Mila G. Newman in partial fulfillment of the requirements for the degree of Master of Education in Adult and Higher Education.

Dr. D. Collett, Supervisor

Dr. D. H. Wertenberger

Professor A. K. Deane

Date: April 12/95

Abstract

The implementation of problem-based learning as an alternate approach to the traditional lecture method is increasing. For the student in nursing this approach offers numerous advantages by way of its emphasis on student-centered self-directed learning, contextual learning, and group process. The increasing complexity and changing nature of client needs require skills and abilities, such as problem-solving, holistic approach, and interdisciplinary discussion, in caring for the clients and therefore must be addressed and fostered in nursing education.

This quasi-experimental study was based on a sample of 100 Nursing 203 students from the Entry 1993 class of the Collaborative Baccalaureate Nursing Program at the University of Alberta Hospitals School of Nursing, Edmonton, Alberta. These students were taught by either the traditional lecture method or the Problem-Based Learning approach in the course. Scores from the final examination were compared between the two groups of students (traditional group=56, PBL=44) to determine differences in the mean values, and analysis of variance was used to determine relationship between the exam scores and the teaching approach. A computer simulated case was administered to 53 students from the total sample (traditional=32, PBL=21) who volunteered. This computer simulated case assigned separate scores for decision-making and information-gathering. Fifty-four students completed a questionnaire to register demographic data, and attitudes and perceptions towards the particular teaching approach they were exposed to in Nursing 203 at the end of the course. Analysis of variance was also used to compare scores from the computer simulated case and responses from the questionnaire, and to shed light on the relationship between the teaching approach and the dependent variables.

Statistical analysis revealed that there were no significant differences in the students' performance in the total final examination scores and in the short-answer questions, but the traditional group showed a statistically significant higher mean in the multiple-choice portion of the examination. Scores in both information-gathering and decision-making also showed no significant difference between the two groups.

Responses to the questionnaire indicated no significant differences between the two groups, except on the area of student participation in class. Students in the PBL group rated their participation level significantly higher than their cohorts in the traditional group.

Findings from the questionnaire, although not statistically significant, however, showed a certain direction of responses. Overall, students from the PBL group rated their experience with the teaching approach slightly more positively in more aspects than did the students from the traditional group with the lecture method.

Acknowledgments

This study was funded by the University of Alberta Hospitals School of Nursing, Edmonton, Alberta, Canada.

I wish to express my sincere appreciation to the students of Entry 1993 class for all their support and cooperation in participating in this study. My deepest gratitude also goes to all the staff, peers, colleagues, and the administration of the University of Alberta Hospitals School of Nursing for their support and kindness.

I would like to thank my thesis supervisor and teacher, Dr. Dave Collett, for the patience, direction, and encouragement he has given me. Without his exceptional approach and guidance, learning would not have been the positive experience I had. His perceptiveness and expertise always kept me on track towards my learning goals.
To Dr. Dana Wertenberger I would like to express my appreciation for the inspiration, guidance, and support I received from her throughout my study and working career at the University of Alberta Hospitals School of Nursing. Her faith in my work and her encouragement helped me through the painful and lonely aspects of graduate study. I would also like to thank Professor Art Deane, my teacher and member of thesis committee, for his significant role in my learning. His comments and suggestions were very much appreciated.

Finally I give my thanks to my family, Craig and Zachary, for all their love and support during the process. Their patience and faith in me will always be my guide.

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Chapter I

Overview of the Problem

Introduction

There is a growing dissatisfaction in nursing education with the traditional or conventional approach of the didactic lecture method where students are expected to sit passively and absorb content from the lecturer (Lewis and Tamblyn, 1987). The collaborative venture in 1991 among the nursing schools in Edmonton was to increase accessibility of nursing students to baccalaureate education. It was also geared towards the development of nurses who are able to function in an increasingly complex health care system thus needing skills for critical thinking and problem-solving. The curricula in the nursing schools were revamped to address these needs in the education of student nurses.

Problem-Based Learning (PBL) was first introduced at McMaster University in 1966 as an innovation to medical education. It encourages contextual learning and is committed to the ideas of self-directed learning, problem-solving, and small group tutorials. Kaufman (1994) summarizes the rationale for the implementation of problem-based learning at Dalhousie University as the ability of problem-based learning: to meet calls for political reforms to education; to fulfill some of the philosophical basis for education (eg. empowerment); to meet principles of good educational practice (eg. student-faculty contact, cooperation, active learning); to provide positive research findings of student

outcomes; and, to fulfill the psychological basis for education (curiosity, relevance, satisfaction) (Kaufman, 1994).

The GPEP Report (1984) of The Association of American Medical Colleges prepared by The Panel on the General Professional Education of the Physician and College Preparation for Medicine drew as one of their conclusions: "To keep abreast of new scientific information and new technology, physicians continually need to acquire new knowledge and learn new skills. Therefore, a general professional education should prepare medical students to learn throughout their professional lives rather than simply to master current information and techniques. Active, independent, self-directed learning requires among other qualities the ability to identify, formulate, and solve problems; to grasp and use basic concepts and principles; and to gather and assess data rigorously and critically" (Muller, 1984, p.9). Recommendations made included evaluating student ability to learn independently, reducing lecture hours where students learn passively, and offering "educational experiences that require students to be active, independent learners and problem solvers, rather than passive recipients of information" (Muller 1984, p.10-12).

Similarly, the need to address these changes in nursing education is in order. To prepare nursing students who are able to function in a changing and increasingly complex health care system, there should be a continuing pursuit for teaching approaches that encourage the development of critical thinking, independent learning, and problem-solving skills. The University of Alberta Hospitals School of Nursing, a joint department of the University of Alberta Hospitals and University of Alberta Faculty of Nursing, is gradually implementing Problem-Based Learning into its curriculum as an alternative approach to teaching nursing students.

Evidence from research findings as presented by Albanese and Mitchell (1993) have indicated some superiority of this approach over the traditional methods in the development of problem-solving and decision-making skills. This is evidenced by comparisons of clinical performance evaluations between students from a PBL track and the traditional

track. These studies, however, involved the education of students in medical schools in both U.S. and Canada. There is minimal research done on the implementation of problem-based learning in nursing education. As the focus of nursing education differs from medical education, nursing students go through different processes and ways in their development and demonstration of decision making skills in light of the different functions and roles that they perform in patient care. Walton and Matthews (1989) state, "PBL is applicable in any educational or training setting. It is not the prerogative of famous new medical schools. It addresses the pressing questions as to why students could not recall or use basic science, or why teachers were either teaching the wrong thing, or else teaching the right thing, as it seemed to them, only to have their teaching habitually forgotten" (Walton & Matthews, 1989, p.546).

Faculty at the University of Alberta Hospitals School of Nursing also believe that PBL will lead to the acquisition of knowledge and development of skills of nursing students to apply the content learned through simulated problem-cases. The development of professional skills in caring for people, such as: problem-solving skills, the holistic approach, self-directed learning, team collaboration, learning to listen, interdisciplinary discussion and collaboration, is the focus of problem-based learning (Heliker, 1994). It provides for the analysis of action in situations that are reality-oriented, simulate ones that are encountered in clinical practice, and, therefore afford the advantage of learning in the context in which learning will be applied (Townsend 1990, Walton et al 1989, Norman 1988, Schmidt 1983).

This study attempted to show the differences between the achievement of nursing students in PBL and in the traditional teaching method (lecture) as measured by the traditional paper-and-pencil test and the kind of decisions made when confronted with a computer simulated case scenario. This study also attempted to show, if any, the difference between these two groups of students in their perception and attitude towards the teaching approach they were exposed to with the use of a questionnaire.

Problem Statement and Research Questions

In comparing Problem-Based Learning with the traditional lecture approach, what differences can be identified in achievement as measured by knowledge gain and problem-solving skills, and in the perception and attitude with the teaching approach among second-year nursing students enrolled in a nursing course at the UAH School of Nursing?
This research is directed by the following more specific research subproblems:

SUBQUESTIONS

1. What is the difference in the knowledge gain between the two groups of students as measured by a paper-and-pencil test?
2. What is the difference in problem-solving skills between these two groups of students as demonstrated when confronted with a computer simulated case situation?
3. What is the difference in the attitude and perception expressed by these two groups of students towards the teaching approach they were exposed to?

Statement of Significance

The results of this study will contribute to the minimal research that has been done so far with regards to the implications of the PBL approach in nursing education. The features of this approach lead the author to believe in its relevance and appropriateness to the education of nursing students especially as they relate to the problem situations that they encounter in the clinical area.

Results of this study can also be significant to nurse educators and faculty who are involved in planning and making decisions on individual courses or curricula. It may also be of significance to faculty who are planning to try implementing the PBL method as a teaching approach.

Delimitations

The study involved full time nursing students enrolled in the Collaborative Baccalaureate Nursing Program during their second year, first university term at the University of Alberta Hospitals School of Nursing site. Nursing 203 is taught over a university term, in both fall and winter terms with four hours of lecture and sixteen hours of clinical experience per week. The students entering this course have had two previous clinical courses.

Limitations

The limitations of a research study refer to "limiting conditions or restrictive weaknesses" (Locke et al, 1987, p. 28) when certain factors of the study can not be controlled. All studies have their limitations, however, the researcher must understand these constraints and indicate to the reader that they have been thoroughly considered during the process of the research study.

This section outlines the limitations of this study although efforts have been made to discuss them as they came along in the course of the study. Despite these "compromised aspects of the study" (Locke et al, 1987, p. 28) it is believed by the researcher that information obtained is valid and useful.

1. Students chose the course section on their own. However, the telephone registration system "guards" against the total self-selection of entire lecture and clinical groups. In other words, registration to a lecture group, for instance, "spills on" to the next section once it reaches twenty from a total number of 24 per group, and registration to a clinical group "spills on" to the next section after it reaches four from a total of eight per group. Therefore there was only a relative randomized selection of samples.

2. Because of registration procedures some students ended up in a course section which was not of their choosing (eg. as in courses getting filled up, etc) therefore ended up in either test group without choice.
3. There is no baseline information on the problem-solving abilities these students brought with them.
4. Some of the students may have been exposed to a similar situation as presented by the written case scenario in previous clinical courses.
5. Other factors that might affect the development of an individual's critical thinking abilities (family background, previous schooling, previous work or life experience, age, etc.) were not considered in this study.
6. Because of the school system limitations the students were not necessarily informed as to what course sections would be taught by PBL, nor were they able to choose from a variety of course sections. There were only four sections offered for the course (two sections taught with PBL and two sections with the traditional method). Students had the option to change sections within the first ten days of the course but even with this the students could still have been restricted by the other nursing course schedules.
7. The response rate for the computer program and attitude and perception survey was low (54% for the survey, 53% for the computer program).
8. The extent to how Problem-based Learning was implemented could have been limited by the individual educator's perception of what PBL really entails. Even with the school administration and collegial support, previous experience and practice with actual implementation of problem-based learning in the classroom was still, however, generally limited.
9. The apparent broadness of interests and high awareness among the school faculty could perhaps resulted with the educators in the traditional group incorporating some

of the concepts of Problem-based Learning in their teaching, contributing to the lack of significant differences between the two groups of students.

10. The admission requirements to the nursing program set by the university, the academic requirements for registration to Nursing 203, and the requirements to maintain a certain academic level to stay in the program could also account for the apparent homogeneity of the two groups in so far as their performance was concerned.

Outline of Remaining Chapters

Chapter II presents a review of related literature available on Problem-Based Learning and its application.

Chapter III is a presentation of the methodology used. Ethical concerns and considerations of the study are also discussed.

Chapters IV and V of the study presents and discusses the resulting findings. Chapter V also offers recommendations for further study and research.

Chapter II

Review of the Literature

Introduction

PROBLEM-BASED LEARNING

The definition of Problem-Based Learning (PBL) offered by the literature is ambiguous. However, Albanese and Mitchell (1993) offer the following definition from their review of all available literature on PBL since 1972. "Problem-based learning at its most fundamental level is an instructional method characterized by the use of patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences" (Albanese & Mitchell, 1993, p. 53). Vernon and Blake (1993) presented PBL in their review as a "method of learning (or teaching) that emphasized (1) the study of clinical cases, either real or hypothetical, (2) small discussion groups, (3) collaborative independent study, (4) hypothetico-deductive reasoning, and (5) a style of faculty direction that concentrated on group process rather than imparting information" (Vernon & Blake, 1993, p.551-552). The three components of learning in a group setting, self-directed learning and problem-solving through lifelike situations are also mentioned by Weir (1990), Townsend (1990), Walton et al (1989), Norman (1988), and Schmidt (1983). Walton and Matthews (1989) cite the following as conditions that facilitate PBL: student-centered and self-directed learning which emphasizes

greater responsibility from students in their learning, small-group tutorials, and independent study (Walton & Matthews, 1989).

Neufeld, Woodward, and McLeod (1989) describe the key features of PBL in medical education at McMaster University as "the analysis of health care problems as the the main method of acquiring and applying knowledge; the development of independent lifelong learning skills by students; and the use of small tutorial groups, with five or six students and a faculty tutor in each group, as the central educational event" (Neufeld, et al, 1989, p. 424).

The learning in PBL has its basis on various learning theories that support its focus on the process of learning itself. PBL "does not specify content but offers a way in which content can be integrated and focused" (Townsend, 1990, p.61). Three principles are cited by Schmidt (1983): prior knowledge, encoding specificity, and elaboration of knowledge. Students use prior knowledge to process new information. PBL facilitates the activation of this prior knowledge when students are made to problem-solve through case situations. These case situations also facilitate the transfer of learning because they simulate the real situation where learning will be applied. PBL activities, such as discussion, peer teaching, group evaluation and study, provide students the opportunity for knowledge elaboration which in turn promotes retention and retrieval (Schmidt 1983, Barrows 1985).

In medical and other professional education it is used as a "multi-stage tutorial process" (Engel, 1991 & Schmidt, 1983, cited in Feletti, 1993) that has become the model for learning problem-solving strategies and basic science (Felletti, 1993). Feletti (1993) went on further as to describe the stages in that tutorial process:

> ... a small group of students meet to discuss a clinical patient problem they have not seen before. They initially get limited data on a real or simulated patient, and are encouraged to use analytical skills (eg, hypothetico-deductive reasoning) and occasional guiding questions from their tutor to diagnose and/or manage the patient's condition. Paper cases

> are typically used, being carefully crafted to help students focus on a well-defined or at least well-structured problem. Cases contain multidisciplinary learning objectives which emerge from the wording and sequence of case-related information. The student group also identifies relevant topics or questions they need to study, and divide these learning tasks between them at the end of the session. They pursue independent studies, generally using textual resources, between sessions. (p.143-144)

During the attempt to diagnose and/or manage the situation the students are encouraged to apply their clinical reasoning skills which in turn furthers their retention and retrieval (Barrows, 1985).

A case might require two or three sessions and be completed within a week. A very important part of the process is at the end of each session when students and tutor review their personal contributions to the group's learning (Feletti, 1993). This also includes students' evaluation of the information sources they used and after careful analysis they make recommendations and suggestions as to how they might have better dealt with the problem (Albanese & Mitchell, 1993).

PBL is different from other problem-centered methods such as the case method where the students confront the problem after they have learned basic science and clinical concepts. In PBL the problem is presented to the students first before they learn these concepts. PBL problems also differ from case histories in that PBL problems do not provide all the information needed to solve the problem at the start. This encourages greater realism and free inquiry (Barrows, 1986).

According to Kaufman et al (1989), the teacher's role in problem-based learning is that of a facilitator, a guide, and a support in the students' quest for learning. The facilitator's role does not include that of a lecturer, nor does it include directing or providing solutions to the problems (Albanese & Mitchell, 1993). The role of the facilitator in PBL is seen as that of both a content expert and group process expert (tutoring skills).

Studies by Davis et al (1992), Eagle et al (1992), and Schmidt et al (1993) showed that content experts were more effective than non-experts as facilitators but all also agree that both content knowledge and tutoring skill are necessary for problem-based learning (Davis et al 1992, Eagle et al 1992, Schmidt et al 1993).

Vernon & Blake (1993), in their review of PBL literature, considered programs that were judged to emphasize these methods to a significant degree to be PBL programs even if some traditional lectures were included. Their review came up with results that generally support the "superiority of the PBL approach over more traditional methods" (Vernon & Blake, 1993, p. 550).

Albanese and Mitchell, in their review of all international literature on PBL from 1972 to 1992, also compared conventional instruction with PBL. The review presented positive outcomes with PBL instruction with regards to: students' response to the approach, performance of graduates on clinical evaluations and faculty evaluations, career preferences made later on in life, and faculty response. Albanese and Mitchell state: "Compared with conventional instruction, PBL, as suggested by findings, is more nurturing and enjoyable; PBL graduates perform as well, and sometimes better, on clinical examinations and faculty evaluations; and they are more likely to enter family medicine" (Albanese & Mitchell, 1993, p.52). Norman (1988) also indicates that problem-based learning is no more expensive than other approaches and is more enjoyable by students and faculty (Norman 1988).

However, the review by Albanese and Mitchell also cites the following findings: PBL students at times scored lower on basic sciences examinations; perceive themselves as less-prepared in the basic sciences; tend to use more "backward reasoning" than "forward reasoning" (which experts use); and, tend to have gaps in their cognitive knowledge which may affect future practice (Albanese & Mitchell, 1993). A survey conducted by Tolnai (1991) among graduates of the Faculty of Health Sciences of McMaster University and the University of Ottawa Faculty of Medicine indicates that the teaching-learning methods

employed in undergraduate education do not necessarily influence continuing medical education and career choice (Tolnai, 1991).

Conclusions drawn from the literature review by Albanese and Mitchell (1993) recommended that institutions be cautious before making curriculum-wide or institution-wide shift to PBL without further evidence of the outcomes with regards to cost, amount of direction students need throughout the training, esp. in medicine, lack of cognitive processing and high resource utilization in PBL students (Albanese & Mitchell, 1993).

Lewis and Tamblyn in 1987 conducted a study that involved the entire senior class (48 students) in a baccalaureate nursing program to work on the following null hypotheses (Lewis & Tamblyn, 1987):

1. There would be no difference in knowledge gain between a group of students exposed to the PBL method (experimental group) and one exposed to the traditional lecture method (control group).
2. There would be no difference between the experimental and the control groups in relation to their improvements in problem-solving ability either a) overall or specific sub-skills (i.e., assess, plan, implement and evaluate) as demonstrated in the clinical practice (hospital) setting. (p.217)

The study compared outcomes between the experimental group (PBL group) and the control group (traditional method). The participants were randomly allocated to the groups but the participants in the experimental group had to agree to be in that group. A 100-question multiple-choice examination was used to test for the gain in theory knowledge and was administered as a pre-test and a post-test. Clinical performance was measured by continuous weekly sampling of behavior in the clinical setting using a standardized evaluation form (Lewis & Tamblyn, 1987). It was shown by the study that there was no significant difference in both the theoretical knowledge and problem-solving skills gain between the experimental (PBL) and the control group (traditional lecture format).

There is, however, minimal literature from studies conducted about the development of superior problem-solving skills in the clinical area among nursing students as a result of being taught the course through the PBL approach. Replication of the study by Lewis and Tamblyn (1987) or further studies of the application of PBL in nursing education is in order. Further study can be conducted within a single course which "can offer a more controlled environment within which to examine the specific effects of PBL" (Albanese and Mitchell, 1993, p.56). It can also be conducted in a different institutional setting from the Tamblyn and Lewis study which could mean a difference in the implementation of PBL, which can happen even within the same institution within different educators.

As implied above, most of the studies comparing the outcomes of PBL compared to the traditional lecture method were done with medical students. As the focus of nursing education differs from medical education, nursing students go through different processes and ways in their acquisition of knowledge and development and demonstration of problem-solving skills in light of the different functions and roles that they perform in patient care.

THE LECTURE METHOD

In the Middle Ages lectures were used as a method of "conveying facts, information, and ideas that could not readily be obtained elsewhere" (DeYoung, 1990, 74). Because of the advent of many ways of conveying information it is sometimes thought that we no longer need lectures as a teaching method. It is also believed that "lectures force students into a passive role" (DeYoung, p.75) and that students learn the same information just as well by reading on their own. However, proponents such as Hyman (1974, in DeYoung 1990), assert that lectures, if properly used, can serve many educational purposes (DeYoung, 1990).

Lectures can take the form of the traditional formal type where the teacher delivers the information from a prepared script and allows for questions towards the end, or they can include a discussion between the teacher and students and further questioning by the teacher.

Purposes of Lectures

DeYoung (1990) discusses ways where lectures are useful in teaching. She states that lectures can be used to "set the stage for a new area of learning" (p.75) and should be followed by other methods to teach the body of the subject matter. Other uses include synthesis of knowledge from various fields, increasing student interest in a topic, clarifying complex concepts, introduction for discussion, and the analysis of a problem or theory (DeYoung, 1990).

Advantages of the Lecture Method

Lectures are economical and can be delivered to a large number of students at any one time. By adding his/her personal experience and enthusiasm, a lecturer can add life to otherwise dry and impersonal information conveyed by a text book. The lecturer also demonstrates his/her thinking processes and delivery skills through the lecture. A well-planned creative lecture can stimulate students' inquisitiveness and can develop their listening abilities. It can also be designed to suit the needs of specific class groups. Many research studies reveal that students often prefer lectures over other teaching methods (DeYoung, 1990).

Disadvantages

Because of the lack of student participation required in a lecture, the students assume a passive role for their learning. DeYoung (1990) alludes to the fact that only few teachers are actually good lecturers and therefore learning objectives are rarely achieved. Learning of the subject matter is also sometimes limited to or greatly influenced by the lecturer's "opinions, assumptions, and even mistakes" (DeYoung, p.82). This is often times reinforced by examinations that only test the lecture content itself (DeYoung, 1990).

The greatest disadvantages lie on the "little emphasis on problem-solving, decision-making, analytical thinking, or transfer of learning" (DeYoung, 1990, p.82) which therefore are less likely to occur in the lecture method. It does not provide opportunity for the student "to learn from peers, to learn by manipulation of data, to discover, to learn visually or through touch, and so on" (DeYoung, p. 82).

Concluding Remarks

Because of the growing emphasis on today's changing role of health care workers and the development of more complex skills and competencies that involve critical thinking and problem-solving in our nursing learners, there is a corresponding growth of interest in the use of teaching approaches that address these needs. Problem-Based Learning, by its very nature and characteristics, encourages the development of critical thinking and problem-solving in students through its emphasis on contextual learning, self-directed learning, problem-solving, and small group tutorials. It offers an alternate approach to the conventional use of the lecture method of teaching. However, literature also states that any teaching approach when properly used can offer a lot of educational advantages as well (Feletti 1993, DeYoung 1990).

This study tried to determine the differences, if any, between some of the outcomes of these two approaches.

Chapter III

Methodology

Introduction

This quasi-experimental study compared the knowledge gain and problem-solving skills, indicated by information-gathering and decision-making skills, between baccalaureate nursing students who were taught a nursing course with the Problem-Based Learning approach, to their peer nursing students who were taught the same course, at the same time and institution, with the traditional lecture method. Scores from the course final examinations and a computer simulated case situation were used to compare these two categories of achievement. A two-part questionnaire was used to gather demographic data and information about the student perception and attitude towards the teaching approach they were exposed to in the study. This chapter will present the methodology, instruments, and procedures used.

The Setting

The School of Nursing is a joint department of the University of Alberta Hospitals (UAH) and the University of Alberta Faculty of Nursing, Edmonton, Alberta. The UAH in Edmonton, a tertiary care facility, is a major health referral center for areas in Northern Alberta. The UAH School of Nursing is funded by the Government of Alberta through the Department of Advanced Education.

The collaboration between the University of Alberta Faculty of Nursing and the three schools of nursing in Edmonton, including the UAH School of Nursing, in September 1991, marked a joint effort to increase access to Baccalaureate Nursing Education in Alberta. As a result these institutions now offer the first two years of a Basic Baccalaureate Program which will then be transferable to the University of Alberta at the third year. With the further merging, the UAH School of Nursing became a joint department of the University of Alberta Hospitals and the University of Alberta Faculty of Nursing. There is now one program jointly offered by these two institutions and all their students enrolled at the university.

Nursing 203 is a clinical course in the collaborative baccalaureate nursing program and is taught over a university term (4 months) in both fall and winter terms. The course content and course objectives, which is a constant for all sections of the course (both control and PBL groups for the study were exposed to the same content), involve learning how to care for adult clients (and their families) who are suffering from varying medical and surgical conditions. The two approaches for delivery of the content were either through the PBL-oriented or the traditional lecture format. There were faculty who chose to use the PBL approach to this course and an equal number of faculty who chose to continue with the traditional lecture method. Because of the school system limitations the students were not necessarily informed as to what course sections were to be taught by PBL, nor were they able to choose from a variety of course sections. There were only four sections offered for the course (two sections taught with PBL and two sections with the traditional method).

Instruments and Techniques

Final Examinations

This study used the results from the final examination, a combined multiple-choice and short-answer type of exam which was administered to all Nursing 203 students at the end of the course to compare the factual knowledge gain between the two groups of students. Seventy percent of the exam questions were constructed by the researcher and reviewed by the faculty teaching the course. The rest of the 30% were provided by the course educators. Most of the multiple-choice items were obtained from the exam bank available for the course and some from the test banks available with the course textbooks. These multiple choice questions are case-based and required the students to apply their knowledge to the situation. Examples of questions used for the final exam are shown in Appendices A & B.

Computer Simulated Case

Students who volunteered to participate were also asked to problem-solve through a computerized simulation of a clinical situation, "An Adult Insulin-Dependent Diabetic" from Clinical Simulations in Nursing II - 2nd Edition from Medi-Sim Inc. (See Appendix C). Feedback for answers given was immediate. Scores were calculated by the computer after the program based on a scoring assignment (Appendix D). A review of the procedure by which this program was produced will follow, including current status of use in nursing education. All of the instructors were also asked to do the test independently and provide feedback to the researcher in an effort to establish content validity. Educators who viewed the computer simulated case stated that the content was appropriate for the course but that the level of difficulty might have been a little high for the students. There were no immediate means for the researcher to change the nature and level of difficulty of the computer simulation.

QUESTIONNAIRE

At the end of the course, a questionnaire to gather demographic data and to register student attitude and opinion with either teaching approach was taken. Some of the questions were taken from the Committee for the Improvement of Teaching and Learning (CITL) Catalog for Instructor Designed Questionnaires used in student evaluation of courses and instruction published by the University Teaching Services and Computing Network Services of the University of Alberta. This questionnaire was pretested on a small sample of students in Nursing 204, a clinical course taught concurrently to the other half of the whole second year level nursing students at the UAH SON. This step was necessary to ensure that the questions are asking what they are intended to seek and to see if these questions are understandable to the participants (Leedy, 1985). The questionnaire is presented in Appendix E.

Marking of the first part of the exams (multiple-choice) was done by computer and the essay part was done by the instructors. To control some of the bias that could result from marking by different educators, the educators reviewed each others students' exam papers. The researcher also reviewed the marking herself to reduce any further bias. These reviews resulted in no changes of the scores.

The Sample

This study involved 2 groups of second-year level of nursing students at the University of Alberta Hospitals School of Nursing in Edmonton, Alberta who were in different sections of Nursing 203 - Nursing Care of the Ill Adult Client and His/Her Family. The final total sample size was 100 students. Forty-four students received the course using the PBL approach. Fifty-six students received the course using the traditional lecture method. There were 103 students registered for the course but two students

withdrew from the course and one was given a grade of "incomplete" due to illness towards the end of the course.

The two groups for the study were:

1. The PBL group - students in two sections of the course who were taught by faculty members who chose to use the PBL approach.
2. The control group - students in two other sections who were taught by faculty members who chose to use the traditional lecture format.

The four course sections had 26, 30, 22, and 22 students, respectively. A faculty member was assigned to each of the four different sections of the course and then the students were divided further into smaller groups of eight students each for their clinical experiences. Each clinical group was managed by a nurse educator. Three of the course leaders also ended up assigned to manage one of the clinical groups from their course sections.

THE USE OF SIMULATIONS IN NURSING EDUCATION

Rapid advancements in technology, increasing levels of complexity and an expanding knowledge base have warranted the need for a "competent practitioner capable of reflective practice" (Gott 1982, Schon 1983, in Roberts et al 1992, p.409). "Reflection requires the development of critical thinking coupled with problem-solving and decision-making skills" (Roberts et al 1992, p.409). PBL, by its nature, offers an alternative teaching approach that not only emphasizes the process but the product of learning as well (Roberts al, 1992). Simulation, such as in patient care scenarios (both written and as computer programs), and in games can be and is currently used as a teaching and evaluation tool in PBL.

"The need for a reflective practitioner capable of sophisticated problem-solving and decision-making demands an education programme geared towards the development of such skills" (Roberts et al, 1992, p.411). Such skills are often developed by exposing

learners to the complex nature of human problems that are also unique to each client or situation. This learning may not always be appropriately offered by the clinical environment as student limitations could have implications to the well-being of clients. The use of simulation in the development of "higher level cognitive skills" offers a "safe environment for student learning and facilitating a fuller exploration of the decision-making process" (Heath 1982, Jooss 1984, & Ross 1988 in Roberts et al 1992, p.411).

Simulation is also extensively used in medicine and nursing as an evaluation tool (Barrows, 1968; Hubbard, 1965; McGuire & Babbott, 1967; Rethans & Van Boven, 1987; all in Roberts 1992). Studies in the USA by Verhonick et al (1968), Sherman et al (1979), McGuire (1972), Farrand et al (1981, 1982), Holzemer & McLaughlin (1988) all looked at different forms of simulation in their use as evaluation tools (Roberts et al, 1992). Verhonick et al's study (1968), replicated by Davis (1972), used filmed patient scenarios and found that the high scores gained in the exercises were "related significantly to professional educational attainment" (Roberts et al, 1992, p.412). In Sherman et al's study (1979), no meaningful relationships were shown when he attempted to correlate the learners' scores on the Patient Management Problem (PMP) with their scores obtained on a multiple choice examination (Roberts et al, 1992). Subsequent studies by Farrand et al (1981,1982) and Holzemer & McLaughlin (1988) explored the validity and reliability of the PMP as an evaluation tool (Roberts et al, 1992). The "complexity of the PMP as an exercise and the difficulty of drawing meaningful generalizations from any results" (Roberts et al, 1992, 413) were noted by all these studies. Roberts et al suggest that the use of simulation in nursing education merits further exploration.

Clinical Simulations in Nursing II-2nd Edition

(Medi-Sim, CAI - Williams & Wilkins Electronic Media)

Computerized clinical simulations aim to provide inexpensive and readily available resource for staff development and continuing education. Clinical Simulations in Nursing II-2nd Edition is composed of more than 200 interactive clinical simulations and tutorials for nursing practice developed by the formerly Medi-Sim, Inc. in Kansas, U.S.A. (now Educational Software Concepts, Inc.), many of which are joint publishing ventures with American national nursing specialty associations, such as the American Association of Critical Care Nurses, the Association of Women's Health, Obstetric and Neonatal Nurses, the Oncology Nursing Society, and the American Organization of Nurse Executives.

The development of these simulations entailed a fairly rigorous process of checks, reviews and consultations from content experts for both the content and structure of the simulation product. Marsha Kruse (undated), the Director of Program Development at Medi-Sim, describes the following process:

1. The publisher solicited authors to submit proposals based on case studies of critically ill patients, which were then judged "on the basis of how well they reflected a nursing framework, utilized appropriate behavioral objectives, demonstrated the author's clinical expertise, and addressed topics of interest based on market research" (Kruse, p. 4).
2. Authors were chosen for each simulation and were gathered as a group in a developmental workshop to learn simulation methodology and construction.
3. The initial review process involved review of the simulations by the authors working on a particular series. This method of critiquing by expert colleagues with similar educational levels and clinical experience was important. The simulation structure was examined by design consultants.

4. The authors submitted the manuscripts for data entry. After this initial data entry authors received printouts to review.
5. A blind review by two independent reviewers (content experts with qualifications comparable to the authors) was done for each module. The reviewer's evaluation and recommendations were given to the authors.
6. Final drafts were submitted by authors to the publisher.
7. Programming was accomplished within 8 weeks of final manuscript receipt.
8. Field testing was done at selected sites nationwide as a method of generating critical feedback from users which were further evaluated by the publisher.
9. Program distribution (within 7 months from the date of the developmental workshop) occurred as the result.

The computer simulation program and the assignment of scores are presented in Appendices C & D.

SELECTED RESPONSE AND CONSTRUCTED RESPONSE ITEM TESTS

A selected-response test item is "one that the examinee answers by choosing among options presented in the test item" (Popham 1978, p.43) such as in a multiple-choice variety of exam. A constructed-response test item, on the other hand, is one that "requires the examinee to actively create a response, typically by writing out a brief or elaborate response" (Popham, p.43) such as in the essay and short-answer variety of exams. Selected-response items are objectively scoreable while essay and short-answer items are more subjective to score which can yield unreliable test results (Popham, 1978).

Selected-response items are designed to measure or assess one's factual knowledge, but can also be used to measure intellectual skills, attitudes, interests, etc. when they present a complex situation in which the examinee must make discriminating choices. On the other hand, constructed-response items are the more effective means of assessing

"ability to write, to synthesize ideas, or to perform certain kinds of complex intellectual operations which call for originality" (Popham, 1978, p.44). The multiple choice questions in the Nursing 203 final examination were all case-based and called for the student's ability to apply their knowledge of the specific situations.

Appropriate choice and balance between the two types of exams is necessary to test the skills and competencies desired to be measured.

DATA COLLECTION

Permission from the Director of the School of Nursing (Appendix F) was obtained to conduct the study within the School of Nursing and for the use of the computer program, the facility, and other resources that were needed. Ethical approval from the Faculty of Education University of Alberta was obtained prior to conducting the study. Permission from the Dean of the Faculty of Nursing University of Alberta (Appendix F) was sought to enable the researcher to access the students who were considered students of the Faculty of Nursing University of Alberta. Cooperation from the nurse educators at the University of Alberta Hospitals School of Nursing was obtained by requesting them individually and personally prior to the issuance of a formal letter (Appendix F) asking for their participation and outlining their role in the study. Permission from the educators was also obtained for the researcher to contact or speak to the students during class times. At that time the researcher informed the students about the nature and purpose of the study, time commitment for the study, confidentiality of their test scores and responses to the questionnaire, and the voluntary nature of their participation with the computer program and questionnaire. Students who were willing to participate with the questionnaire and the computer program were asked to sign a consent form (Appendix G) at this point.

Towards the end of Nursing 203, the problem-solving skills of both student groups were assessed using a computer simulation of a patient care scenario (Clinical Simulations in Nursing II-2nd Edition, Medi-Sim, CAI - Williams & Wilkins Electronic media) available through the UAH School of Nursing Media Center. A letter of permission (Appendix F) from the computer company , Medi-Sim, was obtained for the use of the program for the study. The students worked through the scenario presented by the computer and problem-solved by answering questions arising from the situation. The answers were assessed by the computer and a score for each of both "information gathering" and "decision making" were given at the end of the program.Validity was ensured by having two instructors go through the simulated scenario individually and to provide appropriate feedback to the researcher. Educators who reviewed the computer simulated case said that the subject matter was appropriate for the course but that they also thought the level of difficulty might be a little high for the students. There were no immediate means for the researcher to change the nature and level of difficulty of the computer simulation. Search and review of procedures in the development of the commercial software, including its current status of use by other learning institutions and organizations were presented under methodology.

The students were asked to report to the School of Nursing Media Center, present their identification number, and were then guided to a computer booth. After the completion of the computer program the computer processed their answers and produced their scores. The faculty at the Media Center collected the printed results which the students were asked to seal in brown envelopes provided.

The students from both of the groups were also asked to answer a questionnaire at the end of the course, after the completion of the simulated scenario, to gather demographic data and to determine their attitudes and perception toward either teaching approach that they have been exposed to in Nursing 203. The researcher explained to the students that

their responses to the questionnaire and their comments will not be shown to the educators at all.

The final examination was administered and conducted as per university calendar regulations and schedule (University of Alberta). The final exam results were published only with the student ID numbers.

Ethical Concerns and Considerations

As stated earlier, due to the school system limitations, students were not necessarily informed as to which course sections were to be taught with the PBL approach and which ones were to be taught by the lecture method.

Confidentiality of the student identity in relation to their scores was maintained. This information was included in the consent forms signed by the students at the beginning of the study. All participants to the questionnaire and computer program had to sign a consent for participation. All final exam scores from the 100 students enrolled in Nursing 203 for that term who were able to take the final exams at the end of the course were used. All the students had to be assigned an ID number as well, but non-participants in the computer program and survey questionnaire were not asked to sign the consent form. The participants were informed that some portions of this study were activities to be completed during their **own** time.

The researcher was also managing a clinical group (6 students) in Nursing 203 during the data collection. Only 3 students from the researcher's clinical group participated in the computer program and questionnaire.

PROBLEM-BASED LEARNING IN NURSING 203

This section will describe and provide an overview of the individual nurse educator's implementation of either the traditional approach or the problem-based learning approach in their course sections in Nursing 203. It will also discuss why the individual educator perceived the approach they used to be either the more traditional or the problem-based learning approach, and the extent to which the educators in the PBL group incorporated or threaded the three elements/features of PBL in their teaching: analysis of case situations, student-centered self-directed learning, and small group sessions.

There were four sections in this course. Two educators describe their method to be the "more traditional approach". In both of these sections the majority of the course delivery consisted of lectures on the course content. In one section there were some large group discussion (whole class) involved, sometimes at the end of the class period. Occasionally the whole class was divided into smaller groups (7-9 per group) to discuss a "focused question" on any course topic that the educator had chosen. Case studies, devised by the educator or obtained from textbooks, with guide questions listed, were also used in these small group discussions. During these small group sessions the educator circulated to the different small groups and acted as a guide and facilitated the discussions which were led by a student from the group. Some self-directedness in learning was encouraged with the students, and the content, although scheduled and set by the educator at the beginning of the course, was tentative and flexible. The atmosphere in the classroom was described as informal and friendly, and students were encouraged to raise any course-related questions in class. These two educators described their approach as fairly directive and content driven, with the content mainly provided by the educators and other topic experts. Emphasis on content achievement was also shown by the provision of exam review classes and outlining areas covered in the examinations by one of the educators.

Two of the educators described their teaching approach to be less traditional and problem-based oriented. Both of these educators described the course delivery as centering around the analysis of case situations, whether written or simulations on video tapes. These case situations were based on real situations that are encountered in the clinical area or in the outside world. Each class was divided into small groups of eight students to discuss the cases. The groups in the classroom were determined by the clinical grouping. There were no lectures given and the discussions were led by one of the students in the group, with the educator facilitating and providing some guidance in determining learning issues and in the evaluation of learning that occurred at the end of a case situation. Hand-outs developed or obtained by the educators from various sources were given occasionally to the students which helped them identify the issues from the case studies. One of these educators, on occasion, engaged in a large group discussion of case studies which was moderated by the educator herself. These sessions were organized and pre-planned by the educator as well, with fairly directive guiding questions outlined. For some of the classes the students were allowed to work on the case studies outside of the classroom to research some of the issues identified and report to the group after. The students could contact their educator at these times for further direction and guidance if needed. The research would require various sources like textbooks, library materials, interview with hospital personnel or outside community agencies. Guest speakers were invited to the classroom if there was a perceived need for more expert information on certain topics.

A participation mark was allotted and assigned with input from the group members, self-evaluation by the student, and input from the educator herself. Criteria for the participation mark were determined by the group members and the facilitator. An important aspect of the discussions was the evaluation of learning at the the end of each case which lasted from two to three sessions. Here the educator had the opportunity to provide input into the learning process of the students by way of reviewing the approach and resources used to solve the problem. The evaluation happened when the group determined ways by

which they could have better dealt with the problem. Both of these educators describe their approach to be emphatic of self-directedness of students in learning, student-directed discussions, small group sessions, analysis of case situations, with the role of the educator as being mainly facilitative and not directive.

It was implied that the teaching approaches employed by the educators in the control group (traditional), although describing their approach as mainly directive (through lectures) and content driven, also occasionally used some methods that encouraged self-directedness in student learning, small group discussions, case analysis, and educator facilitative role, which are basic features of the problem-based learning approach. There was also evidence of course material sharing by the educators in both groups, especially in the case studies used. Educators in the problem-based learning group also employed some resources and methods used by the traditional group, such as the large group discussions led by the educator, information sessions by way of guest speakers, learning guides, and scheduled topics. However, the educators shared a perception that they differed in the extent to which their approaches emphasized self-directedness in the students, group dynamics and small-group tutorials, method of content achievement and cognitive learning processes, and the amount of direction given by the educators.

Nursing 203 Clinical Component

Students in Nursing 203 were assigned to a variety of medical and surgical settings for the care of the adult client at the University of Alberta Hospitals, including areas such as General Surgery, Orthopedics, General Medicine, Cardiology, and Neurosurgery. There were a total of 8 clinical groups of students (6-8 students each) from the traditional group with one educator managing each section. There were 6 groups of students (6-8 students each) from the PBL group with an educator for each group as well. Three educators who taught the lecture sections, either by the PBL or the traditional method, each managed one of these clinical sections. There was little evidence, however, that these course educators influenced the clinical supervision, post-conference activities and discussions, and clinical

evaluation of the rest of the students in the other clinical groups. Occasionally common sessions were held between the groups when special speakers were invited or certain skills were decided to be taught in bigger groups, but these were only done for coordination of efforts and resources. The extent to which elements like self-directedness, group dynamics, and problem-solving in each clinical group is not addressed in this study. This would have involved the inclusion of clinical ratings, evaluations, and documentation of actual clinical performance which in itself would be affected by the introduction of different variables. As mentioned earlier, the researcher had three of the study participants in the clinical group of students that she supervised during the term.

SUMMARY

Final examination scores from 100 Nursing 203 students from the University of Alberta Hospitals School of Nursing were used to compare the knowledge gain between two groups of nursing students who were taught either by the traditional or the problem-based learning approach. The final examination consisted of both multiple-choice and short-answer items. A computer simulation case was administered to volunteers to determine any difference in the information-gathering and decision-making skills of the same groups of students. Finally, the student volunteers were also asked to complete a questionnaire to register their attitudes and perceptions towards the teaching approach they were exposed to in Nursing 203. Fifty six of these students were taught by the traditional lecture method and 44 were taught by the PBL approach. Only fifty four of the 100 students (traditional=33, PBL=21) completed the questionnaire and 53 (traditional=52, PBL=21) volunteered to do the computer simulation case. The questionnaire also gathered demographic data of the students.

The next chapter will present the data, analyses, and findings obtained from the instruments described in this chapter.

Chapter IV

Presentation of Results

Introduction

This chapter presents an analysis of the data obtained through the instruments and methodology described in Chapter 3. The data gathered by the questionnaire provided demographic information regarding the students and their attitude and perceptions toward the teaching approaches they were exposed to in Nursing 203. Analysis of variance (ANOVA) was used to test relationships between the students' attitudes and perceptions and each of the teaching approaches. Only 54 out of a 100 students filled out the questionnaire.

Scores from all 100 students for the final exams were examined and analysis of variance was done to test for possible relationships between the exam results and the teaching approach. The final exams consisted of multiple choice items and short answer type items. The total score for the final exams and the separate scores for each of these types of items (multiple choice and short-answer) were also tested.

In addition, separate scores for decision-making and data-gathering from the computer based assessment (CSC) were compared between the two groups of students. Analysis of variance was again utilized to determine relationship between these scores and the teaching approach. Fifty three out of the 100 students completed the computer program.

The influence of variables such as age, previous educational experience (whether attended and/or completed college or university), previous work experience, previous health care experience, and previous GPA were statistically controlled in an attempt to expose the barebone relationship between the teaching approach and the various dependent variables in the study. The results showed that these external variables did not affect the statistical significance of the relationships. Further discussion of these covariates was done under each of the research questions and the questionnaire items as relevant.

Further investigation was done to determine if there would be a difference in the results of ANOVA on the subsample of students (53) who were involved in all aspects of the study (final exams, computer program, questionnaire) versus the total sample of 100 students. There were minimal differences in the comparison of these results.

SUBJECT DATA

The questionnaire, which was developed by the researcher, was used in this study to gather information regarding the students background (Part I) which included their previous education prior to entering the program, previous work, previous health care experience and type. It also included questions asking whether they had previously encountered a similar situation as in the computer simulation; whether they had been exposed to a similar teaching approach in previous courses; and, whether they were in a group of their choosing in Nursing 203. Part II of the survey gathered information about the students' attitude and perception toward the teaching approach used in the nursing course. Table 1 presents the demographic data.

Table 1
Subject Data

Characteristics	Results	
Demographic Data	n	%
Male	13	13%
Female	87	87%
Total number of students	100	100%
Age range	18-47 yrs	
Mean age	22.62	
Mode	19.00	
Median	21.00	
Total number of students	100	
Marital Status		
Married	7	13%
Single	44	81.5%
Other	3	5.6%
Total number of students	54	100%
Residents of Edmonton	34	63%
Residents of Alberta	49	90.8%
Other province	5	9.3%
Previous Education		
No postsecondary education	22	40.7%
College - not completed	1	1.9%
- completed	8	14.8%
- did not indicate	1	1.9%
University - not completed	18	33.3%
- completed	4	7.4%
Total number of students	54	100%
Advanced Credit		
With advanced credits	29	53.7%
Total number of students	54	100%
Work Experience		
Previous work experience	30	55.6%
No previous work experience	23	42.6%
No response	1	1.9%
Total number of students	54	100%
Work experience < 6 months	7	13%
6- 12 months	4	7.4%
1-5 years	12	22.2%
5-10 years	2	3.7%
10 years plus	6	11.1%
Health Care Experience		
No experience	36	66.7%
RNA	3	5.6%
RPN	6	11%
PCA	9	16.7%

Demographic Data

The students in this sample ranged in age from 18 - 47 years (mean age - 22 years; mode - 19 years; median - 21 years), with 76% of them less than 23 years of age. Thirteen percent of the subjects were males and 87% were females. Out of the 54 students who filled the questionnaire 44 (81%) were not married and 13% had dependents. Forty-nine students (90.8% overall) of the study participants were Alberta residents, with 63% residing in Edmonton. Five students identified their permanent addresses outside of Alberta.

Educational Characteristics

Out of the 54 students who filled the questionnaire, 13 (24.1%) had attended college, and 8 (14.8%) had completed a diploma. Twenty-two students (40.7%) had previous university education, four of which (7.4% overall) have completed a degree. Twenty-nine students (53.7%) received advanced credits for courses completed prior to admission in the University of Alberta Hospitals School of Nursing program.

The whole sample of students (100) were in their second year of the program and all of them have been through two clinical courses in nursing fundamentals and health and physical assessment.

Work Experience

Prior to admission to the program, thirty (55.6%) of the 54 students who responded to the questionnaire revealed previous paid work experience (6 months or less = 13%, 6-12 months = 7.4%, 1 - 5 years = 22.2%, 5-10 years = 3.7%, 10 years or more = 11.1%). The findings also reveal that 31.5% (18) of these students had worked in the health care field, three of them as Registered Nursing Assistants (RNA), six as Registered Psychiatric Nurses (RPN), and nine of them as Personal Care Attendant (PCA).

Other Data

Ten of the 54 students (18.5%) who filled the survey had encountered a similar situation as the computer simulation used in the study in previous clinical situations.

Eighteen of these 54 students (33.3%) had been previously exposed to a similar teaching approach as they had in the course (traditional=15, PBL=3), and thirteen (24.1%) were aware of the teaching approach to be used in the course prior to registration. Thirty-eight of these 54 students (70.4%) admitted that they were in the course group of their choosing.

RESEARCH FINDINGS

The findings and statistical analyses are presented under each of the research subquestions.

Research Question 1. What is the difference in the knowledge gain between these two groups of students as measured by a paper-and-pencil test?

Scores from the final examinations were analyzed and compared between the two groups of students. ANOVA analysis was used to determine the relationship between the exam scores and the teaching approach. The final examination was made up of two parts, multiple choice items and short-answer items. Due to slight variations in the highest possible total scores for the multiple choice item part for the 4 different sections (110, 115, 116, 114), the exam scores were expressed in percentages (Refer to Table 2).

Table 2

Final Examinations Means

	Traditional	PBL	Sig
Exam Total	74.19	72.38	.149
Multiple Choice	69.16	65.94	.033
Short Answer	88.89	89.711	.58
n = 100 students (total)	56	44	

A number of factors such as age, previous work experience, previous health care experience, previous GPA, or whether they have attended and/or completed college or university, were looked at to statistically control their effects on the relationship between the teaching approach and the total examination score. These factors did not change the level of significance in the relationships between the two variables.

The total exam score mean for the traditional group was slightly higher (74.19) than that of the PBL group which was 72.38. The Sum of Squares, which shows us where the variation in respondent answers occurs, showed that the variation in exam scores was maybe due to the teaching method. This is seen by comparing the "within" Sum of Squares (892.77) and the "between" sum of squares (977.59).

The strength of the relationship between the dependent variable (knowledge gain) and independent variable (teaching method) was measured by the eta squared. The eta squared value of .11 did not show a very strong relationship between the 2 variables of knowledge gain and the teaching method.

Finally, the difference was not statistically significant at 0.14. This statistical significance says that there may only be an 86% chance that these results were due to true differences between the two groups.

The traditional group showed a statistically significant (.03) higher mean score of 69.16 than the PBL group's mean score of 65.94 in the multiple-choice items. The F-ratio was 4.8. The sums of squares between was 1226.6 and within was 1459.66 which showed that the variation of scores was maybe due to the independent variable (teaching approach). The eta squared was .17 which indicated a relationship between the independent variable (teaching method) and the dependent variable (multiple choice items).

The findings were slightly different with the short-answer part of the exam. The mean for the traditional group was slightly lower than the PBL group. The sum of squares between was 98.9 and within was 415.78. Eta squared was .003 which again showed a

very weak relationship between the variables. The F-ratio was small at .3 and the statistical significance was low at .58.

To summarize, students from the traditional group showed a significantly higher mean score in the multiple choice portion of the final exams, which in turn was reflected in the exam totals. The students from the PBL group, however, showed a very slightly higher mean score in the short answer portion of the exam. This did not change the exam total standing.

Research Question 2. What is the difference in the problem-solving skills between these two groups of students as demonstrated when confronted with a simulated clinical situation?

This study measured the problem-solving skills of the students in terms of their decision-making and information-gathering skills.The computer simulation rated the students for both their decision-making and information-gathering abilities separately. Only a total of 53 students out of the total sample of 100 volunteered to do the computer program. Thirty-two of these students came from the traditional group and 21 from the PBL group.

The PBL group showed a slightly higher mean value of 28.14 compared to 26.4 for the traditional group in decision-making. The SS showed that the variation was maybe due to random error and not to the independent variable. The F-ratio was small (.026) and the significance was low (.87). There was also a weak relationship between these 2 variables as shown in the eta squared value.

The mean values for information-gathering (traditional=15.52, PBL=16.57) also showed a low significance of .94 and a small F-ratio (.006). The eta squared value again showed a weak relationship between the information gathering skills of the students and the teaching method. Please refer to Table 3.

Table 3

Computer Simulation

Means

	Traditional	PBL	Sig
Decision-making	26.4	28.1	.38
Information-gathering	15.5	16.6	.40
n = 53 students (total)	32	21	

Although not statistically significant, the students in the PBL group showed slightly higher means in both decision making and information gathering than the students in the traditional group. Efforts to control the influence of covariates such as age, previous work experience, previous education which included whether they attended/completed college or university, previous health care experience, and previous GPA , however, did not change the statistical significance of the relationship between the teaching approach and the variables (information-gathering and decision-making). The results showed that the previous GPA was the main influencing factor in the information-gathering and decision-making abilities of the students. Previous work experience was the next most influencing variable. The results also showed that the teaching approach and previous educational experience were among the least influencing factors in the decision making and information gathering skills of the students.

Research Question 3. What is the difference in the attitude and perception expressed by these two groups of students towards the teaching approach they were exposed to?

Part II of the questionnaire gathered information regarding the students' perceptions and attitudes towards the teaching approach they were exposed to in Nursing 203. There were 28 questions included and the statistical results are presented under each of the survey questions. Only 54 students out of the total sample of 100 filled the questionnaire. Thirty three of these student belonged to the traditional group and 21 belonged to the experimental group. ANOVA analysis of student attitudes and perceptions toward the teaching approach they were exposed to was done for the two groups of students. The answers were placed in a Likert Scale, a 5-point scale with 1 indicating "strongly disagree" to 5 indicating "strongly agree". Statistical results from the questionnaire are presented under each of the questions.

Although there were no significant statistical differences (set at .05) between the scores for the variables in the attitude and perception survey, the following trends were observed:

For Questions 6, 8, 9, 10,12, 13, 14, 15, 16, 17, 20, 22, 23, 24, 25, and 28, the PBL group consistently rated the course teaching approach slightly more favorably than did the students in the traditional group. These questions had to do mainly with flexibility of the teaching method, the amount of learning and understanding of the subject matter (factual knowledge, application of principles, identification of issues), problem-solving, creativity, challenge presented, group process (attendance, participation, helping classmates learn), and appropriateness of assigned work. Students from the PBL group also felt that they were challenged intellectually and to perform at their fullest potential slightly more than their cohorts did. These students also rated their instructor and course (Questions 14 and 15) slightly higher.

Means for Question 21 which asked students whether they actively participated in class discussions showed a statistically significant difference between the two groups

(.026), the PBL group with a mean of 4.24 compared to the traditional group's mean of 3.73.

Question 19 which asked students if they were stimulated to do outside reading about the course material was rated low by both groups (Traditional=2.91, PBL=2.67).

Question 7 which asked students to rate their "satisfaction" with the teaching approach showed a higher mean for the traditional group. Satisfaction was not, however, defined in more specific terms throughout the study.

Students in the PBL group perceived their learning gain to be higher, as measured by Questions 9 (factual material) and 10 (understanding of concepts/principles), and also perceived that they learned more in this course than in most other courses (Question 15), more so than did their counterparts. Findings relating to Research Question 1 showed the PBL group scored lower in the Final exams - multiple choice portion but slightly higher in the short answer portion. The PBL group also showed slightly higher means with both decision making and information gathering in the computer simulation (Research Question 2 findings).

The students in the traditional group showed slightly higher means (although not statistically significant) in Questions 1 (enjoyment with the method), 2 (easiness in learning new material with the method), 3 (retention of learned material), 4 (having no difficulty using method for other areas), and 5 (finding the approach more effective than other methods encountered).

Questions 11 (learning to apply principles from course to new situations), 18 (enthusiasm about the course material), 26 (good use of class time), and 27 (achievement of course objectives), had minimal difference in the means from both groups.

Discussion of the individual items from the questionnaire follows. Relevant statistical findings will also be discussed.

THE ATTITUDE/PERCEPTION SURVEY (PART II OF THE QUESTIONNAIRE)

The responses to the questions were put on a Likert Scale, ranging from 1 to 5, with 1 being Strongly Disagree and 5 being Strongly Agree. ANOVA analysis was used to determine the relationships between the variables. The ANOVA analysis values are presented under discussion of each of the questionnaire item.

1. **I enjoyed this method of instruction.**

A comparison of the means showed the traditional group with a slightly higher mean score for enjoyment of the method compared to the PBL group. The sums of squares (SS) show us where the variation in respondent occurs. The SS values indicated that the variation in the responses for this question was maybe due to random error, not the teaching approach. The eta squared value also showed a weak relationship between the dependent variable (enjoyment of the method) and the independent variable which is the teaching approach. The statistical significance of the relationship was seen in the F-ratio and the statistical significance which were both low. (Refer to Table 4) Analysis of the covariates showed that previous health care experience was the most influencing factor in the enjoyment of the teaching approach of these students.

Table 4

	Traditional	PBL
Mean	3.58	3.28
n	33	21
Sums of squares		
Between groups	1.08	
Within groups	34.35	
eta squared =	.03	
F =	1.63	
Significance =	.20	

Looking back to the student data it was seen that 38 students (70%) out of the 54 students who completed the survey said they were in a group of their choosing.

Twenty students from the traditional group of 33 students (60%) were in their group of choice and 18 students out of the PBL group of 21 students (85%) said they were in their group of choice. This was reflected in the whole group's grand mean of 3.46 in rating their enjoyment of the teaching approach.

2. **I found it easy to learn new material with this method.**

Analysis showed a slightly higher mean score for the traditional group. The SS values showed that the variation in responses occurred maybe due to random error. The eta squared showed a weak relationship between the students finding it easy to learn new material with the teaching approach. The statistical significance was low. (Refer to Table 5) Analysis of the covariates showed that previous experience in health care, work, and postsecondary education were more influential with this variable than the teaching approach.

Table 5

	Traditional	PBL
Mean	3.60	3.43
n	33	21
Sums of squares		
Between groups	.40	
Within groups	29.02	
eta squared =	.013	
F =	.72	
Significance =		.40

3. **This approach provides for great retention of learned material.**

There was a minimal difference in the means between the two groups of students, and again the variation in responses was maybe due to random error. There was a weak relationship between retention of learned material by the students and the teaching approach. The statistical significance was low.(Table 6)

Table 6

	Traditional	PBL
Mean	3.33	3.24
n	33	21
Sums of squares		
Between groups	.12	
Within groups	31.14	
eta squared =	.004	
F =	.19	
Significance =		.66

4. **I would have no difficulty using this method for other areas.**

Again there was minimal difference in mean scores between the two groups of students, a weak relationship between the variables, and a low statistical significance.(Table 7)

Table 7

	Traditional	PBL
Mean	3.45	3.28
n	33	21
Sums of squares		
Between groups	.36	
Within groups	36.47	
eta squared =	.01	
F =	.52	
Significance =		.47

5. **I found this approach more effective than other methods.**

Students from the traditional group found the approach more effective than other approaches they have been exposed to compared to the PBL group. The statistical significance, however, was low. (Table 8) Among the covariates, age was the closest factor to being influential with this variable although still not statistically significant.

Table 8

	Traditional	PBL
Mean	3.09	2.86
n	33	21
Sums of squares		
Between groups	.70	
Within groups	41.3	
eta squared =	.017	
F =	.88	
Significance =		.35

6. **I found this method of learning flexible enough for my schedule.**

There was a small difference with how the students from the two groups perceived the flexibility of the method for their schedules (the PBL group with a slightly higher mean) and a low statistical significance of relationship between the variables. (Table 9) The covariates were also not influential to this item.

Table 9

	Traditional	PBL
Mean	3.64	3.90
n	33	21
Sums of squares		
Between groups	.92	
Within groups	19.45	
eta squared =	.04	
F =	2.47	
Significance =		.12

7. **I was satisfied with the teaching approach used in my group.**

A very minimal difference is seen with the level of satisfaction of students from the two groups with the teaching approach used. Satisfaction was not defined in more specific terms in the questionnaire for the students nor in the study itself. (Table 10) Previous health care experience had the most effect among the covariates towards this variable.

Table 10

	Traditional	PBL
Mean	3.61	3.57
n	33	21
Sums of squares		
Between groups	.02	
Within groups	43.02	
eta squared =	.0004	
F =	.019	
Significance =		.89

8. **I felt that I was performing up to my potential in this course.**

Student responses from the two groups showed a minimal difference with how the students perceived their performing up to their potential in the course. (Table 11)

Table 11

	Traditional	PBL
Mean	3.12	3.38
n	33	21
Sums of squares		
Between groups	.86	
Within groups	42.47	
eta squared =	.02	
F =	1.06	
Significance =		.31

9. **I learned a good deal of factual material in this course.**

The difference in how much factual material the students perceived they were learning was also small, with the PBL group having a slightly higher mean than the traditional group.(Table 12) As discussed earlier, results from the multiple choice portion of the final exam showed statistically significant higher scores for the traditional group. Previous GPA had the most effect on this variable.

Table 12

	Traditional	PBL
Mean	3.64	3.90
n	33	21
Sums of squares		
Between groups	.92	
Within groups	47.44	
eta squared =	.02	
F =	1.01	
Significance =		.32

10. **I gained a good understanding of concepts/principles in caring for the elderly adult and family.**

Students in the PBL group showed a slightly higher mean score than students from the traditional group in their perception of how well their understanding was of concepts and principles in caring for the elderly adult and family, which was the focus of Nursing 203. The statistical significance of the relationship was low. (Table 13) Among the covariates, previous health care experience and previous GPA were th more influencing factors towards this variable.

Table 13

	Traditional	PBL
Mean	3.58	3.81
n	33	21
Sums of squares		
Between groups	.70	
Within groups	35.3	
eta squared =	.02	
F =	1.03	
Significance =		.31

11. I learned to apply principles from this course to new situations.

There was no difference in the students' perception of their learning to apply principles to new situations between the two groups. Based on the analysis, the teaching approach was not a factor in how well the students learned application of principles from the course to new situations. (Table 14) Previous health care experience had the most effect on this variable.

Table 14

	Traditional	PBL
Mean	3.64	3.62
n	33	21
Sums of squares		
Between groups	.004	
Within groups	36.59	
eta squared =	.0001	
F =	.005	
Significance =		.94

Looking at the results of the decision-making and information-gathering abilities (which would involve application of learned principles to new situations) demonstrated in the computer simulated case, the PBL group showed a slightly higher mean, although the statistical significance was low.

A minimal difference was shown between how well the two groups of students felt they learned to identify main points and issues in Nursing 203. (Table 15) Although it was not statistically significant, the PBL group showed a slightly higher mean than the traditional group. Identification of main points and central issues in situations is one of the main activities and emphasis of problem-based learning.

Table 15

	Traditional	PBL
Mean	3.64	3.76
n	33	21
Sums of squares		
Between groups	.20	
Within groups	31.45	
eta squared =	.006	
F =	.33	
Significance =		.56

13. **I developed the ability to solve real problems in this field.**

The students from the PBL group rated their ability to problem-solve slightly higher than their cohorts in the traditional group. These results, although showing a non-statistically significant relationship between the variables, were consistent with results from the computer simulation, which also showed slightly higher mean scores for the students from the PBL group in both decision-making and information-gathering. (Table 16) ANOVA showed age and previous health care experience to be the more influencing factors towards this variable.

Table 16

	Traditional	PBL
Mean	3.48	3.71
n	33	21
Sums of squares		
Between groups	.68	
Within groups	26.53	
eta squared =	.025	
F =	1.32	
Significance =		.26

14. I learned a lot in this course from the instructor.

There was minimal difference in the way the two groups of students rated their learning attributed to the instructor herself. This question was intended to measure to an extent, in the students' perception, how the more directive educators in the traditional group fared with the more facilitative educators in the PBL group. (Table 17) In relating their perception of learning gain from their educator to their actual exam scores it was seen that the traditional group had higher total exam scores than the PBL group.

Table 17

	Traditional	PBL
Mean	3.48	3.57
n	33	21
Sums of squares		
Between groups	.10	
Within groups	39.38	
eta squared =	.0024	
F =	.13	
Significance =		.72

15. **I learned more in this course than in most other courses.**

There was a very small difference in the way the two groups of students (both PBL and traditional) perceived their amount of learning was in this course compared to their learning in most other courses. The PBL group again showed a slightly higher mean than the traditional group. (Table 18) Total exam scores showed that the traditional group had a higher mean, although not statistically significant, than the PBL group.

Table 18

	Traditional	PBL
Mean	2.91	3.05
n	33	21
Sums of squares		
Between groups	.25	
Within groups	43.68	
eta squared =	.0056	
F =	.29	
Significance =		.59

16. **I put more effort into this course than into most other courses.**

The students from the PBL group rated their efforts into the course slightly higher than their cohorts from the traditional group. The statistical significance of the results was low but was slightly higher than the relationships shown with other variables. (Table 19) As mentioned earlier the PBL group also perceived their learning from the educator and the course itself to be slightly higher than the traditional group, although the total exam scores mean for the traditional group was higher than the PBL group.

Table 19

	Traditional	PBL
Mean	3.00	3.33
n	33	21
Sums of squares		
Between groups	1.43	
Within groups	54.66	
eta squared =	.02	
F =	1.36	
Significance =		.25

17. **I deepened my interest in the subject matter of this course.**

The relationship was not statistically significant at .15 but this value was higher than most of the other variables in the survey. Students in the PBL group showed a slightly higher mean in this category. (Table 20)

Table 20

	Traditional	PBL
Mean	3.45	3.81
n	33	21
Sums of squares		
Between groups	1.62	
Within groups	39.42	
eta squared =	.04	
F =	2.13	
Significance =		.15

18. I developed enthusiasm about the course material.

Both groups rated their enthusiasm level about the course material almost the same.(Table 21)

Table 21

	Traditional	PBL
Mean	3.30	3.33
n	33	21
Sums of squares		
Between groups	.012	
Within groups	35.64	
eta squared =	.0003	
F =	.017	
Significance =		.90

19. I was stimulated to do outside reading about the course material.

Both groups of students indicated that they were not really stimulated to do outside reading about the course material as shown by the mean ratings in this category. The traditional group showed a slightly higher mean than the PBL group. There was no significant relationship between this variable and the teaching approach used. (Table 22)

Table 22

	Traditional	PBL
Mean	2.91	2.67
n	33	21
Sums of squares		
Between groups	.75	
Within groups	37.39	
eta squared =	.02	
F =	1.05	
Significance =		.31

20. This method challenged me intellectually.

The students from the PBL group showed a slightly higher mean than the traditional group. The statistical significance of the relationship between this variable and the teaching approach was low. (Table 23) ANOVA showed the teaching approach to be the most influencing factor with this variable.

Table 23

	Traditional	PBL
Mean	3.36	3.71
n	33	21
Sums of squares		
Between groups	1.58	
Within groups	37.92	
eta squared =	.04	
F =	2.16	
Significance =		.15

21. I actively participated in class discussions.

There was a statistically significant relationship in the results (.02) between this category and the teaching approach. Students from the PBL group said they actively participated in the class discussions more than their peers in the traditional group did. (Table 24) Previous GPA and post secondary education were the next most influencing variables.

Table 24

	Traditional	PBL
Mean	3.73	4.24
n	33	21
Sums of squares		
Between groups	3.35	
Within groups	32.36	
eta squared =	.09	
F =	5.38	
Significance =		.02

22. I attended class regularly.

There was no perceived difference in class attendance between the two groups of students. (Table 25)

Table 25

	Traditional	PBL
Mean	3.97	4.00
n	33	21
Sums of squares		
Between groups	.012	
Within groups	54.97	
eta squared =	.0002	
F =	.01	
Significance =		.92

23. I utilized all the learning opportunities provided.

There was a minimal difference in the means for this category suggesting that the students from both groups utilized learning opportunities in the course to the same extent. (Table 26) The teaching approach was the most influencing factor among the covariates.

Table 26

	Traditional	PBL
Mean	3.36	3.52
n	33	21
Sums of squares		
Between groups	.33	
Within groups	36.87	
eta squared =	.009	
F =	.46	
Significance =		.50

24. I created my own learning experiences in connection with the course.

Again there was very small difference in the means (PBL group with a slightly higher mean) between the two groups. The results also show a low statistical significance of the relationship between this variable and the teaching approach. (Table 27) Previous work experience was the most influencing factor among the covariates.

Table 27

	Traditional	PBL
Mean	3.48	3.52
n	33	21
Sums of squares		
Between groups	.02	
Within groups	29.48	
eta squared =	.0007	
F =	.03	
Significance =		.85

25. I helped classmates learn.

There was a very small difference in the way students perceived the extent to which they helped each other learn in their respective groups. (Table 28)

Table 28

	Traditional	PBL
Mean	3.61	3.71
n	33	21
Sums of squares		
Between groups	.15	
Within groups	20.16	
eta squared =	.007	
F =	.39	
Significance =		.54

26. Class time was used well.

Both groups of students felt they used class time almost equally well. (Table 29) Previous GPA and age were the more influencing factors to this variable.

Table 29

	Traditional	PBL
Mean	3.54	3.52
n	33	21
Sums of squares		
Between groups	.006	
Within groups	45.42	
eta squared =	.0001	
F =	.007	
Significance =		.93

27. The objectives of the course were achieved.

Again both groups of students felt that the course objectives were achieved in their groups almost equally.well (Table 30)

Table 30

	Traditional	PBL
Mean	3.88	3.81
n	33	21
Sums of squares		
Between groups	.06	
Within groups	26.75	
eta squared =	.002	
F =	.12	
Significance =		.73

28. **The type of assigned work was appropriate to the goals of the course.** Students from the PBL group felt slightly better about the assigned work in the course than did the traditional group. The relationship between the variables was low. (Table 31)

Table 31

	Traditional	PBL
Mean	3.82	3.95
n	33	21
Sums of squares		
Between groups	.23	
Within groups	21.86	
eta squared =	.01	
F =	.55	
Significance =		.46

Comments written by students at the end of questionnaire are presented in Appendix H. These comments consisted of specific suggestions regarding content presentation (teaching strategies), some concern regarding the course workload from both traditional and problem-based group, concerns about content coverage, amount of instructor guidance, group participation, and retention of learned material. The students who commented identified concerns with the teaching approach they were exposed to, but this was true for both groups of students.

SUMMARY

The attitude and perception survey did not show statistically significant relationship between the variables from the survey and the teaching approach with the two groups of students, except with Question 21, which asked the students if they actively participated in class discussions. Students from the PBL group showed a statistically significant (.026)

higher mean of 4.24 compared to the traditional group (3.73). The overall survey findings, however, showed a certain direction of responses. In most of the 28 variables used to determine attitudes and perceptions, students from the PBL group revealed a tendency to rate their experience with the teaching approach slightly more positively (17 out of the 28 variables) than did the students from the traditional group. There were minimal differences in 4 of the variables between the two groups of students. The traditional group rated their experience slightly more positively in 7 variables.

Chapter V

SUMMARY, DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

SUMMARY

PURPOSE OF THE STUDY

The purpose of this study was to compare the knowledge achievement gain, problem-solving skills, and attitude and perception of two groups of nursing students, one which was taught by the PBL approach and the other by the more traditional lecture method.

The research was guided by the following subproblems:

1. What is the difference in the knowledge gain between these two groups of students as measured by a paper-and-pencil test?
2. What is the difference in the problem-solving skills between these two groups of students as demonstrated when confronted with a simulated clinical situation?
3. What is the difference in the perception and attitude expressed by these two groups of students towards the teaching approach they were exposed to?

Research Design and Methodology

There were three instruments used by the study to measure the difference between the two groups of students. The first one, intended to measure the knowledge achievement gain of the students, was in the form of the final examinations administered to students at the end of the course. The final examination was composed of both multiple-choice items (110-116 points) and short-answer type of questions (40 points). The second instrument was a computer simulation case focusing on the adult insulin-dependent diabetic. The students problem-solved through the situation and were assigned separate scores for their decision-making and information-gathering skills by the computer at the end of the program.

The third instrument involved the use of a two-part questionnaire which was completed by the students after they went through the computer simulation. The first part of the instrument gathered demographic data about the students, including previous health care experience, educational experience, information as to whether the student had encountered similar situations as in the computer, or whether they had been previously exposed to the same teaching approach as in Nursing 203.

Part II of the questionnaire gathered data regarding the students' attitude and perceptions towards the teaching approach used in their class in Nursing 203. It was made up of 28 questions covering areas of enjoyment, satisfaction, knowledge retention, flexibility, enthusiasm, interest in the subject matter, learning of factual material, problem-solving ability, understanding of concepts and principles, intellectual challenge, class participation, attendance, creativity, use of class time, achievement of course objectives, workload and course assignment.

Findings

There were 100 students that ended up in the total sample. These were the students who took the final exams at the end of the course (traditional group=56 students, PBL=44 students). There were 103 students registered at the beginning of the course, but two of

them withdrew from the course and one ended up with a grade of "incomplete" due to illness during the period of the final exams. The final exam scores of these 100 students were used for the study. Consent to use the exam scores was not required as the exams were administered according to university regulations and results published under the students' ID numbers. As a faculty staff at the school of nursing these results were also available to the researcher as long as confidentiality was maintained. To this end the students were all assigned Research ID Numbers for the study.

Sixty four students from the total sample volunteered to do the computer study and survey questionnaire. Out of the 64 only 54 students (traditional=33 students, PBL=21 students) actually completed the survey questionnaire and only 53 (traditional=32, PBL= 21 students) did the computer simulation.

ANOVA analyses were utilized to determine the relationships between the variables. The following statistical values were looked at: means, sums of squares, eta squared, and the statistical significance of the relationships as shown by the F-ratio and the statistical significance.

Scores from the final examination were analyzed and compared between the two groups of students. ANOVA analyses were used to explore the relationship between the exam scores and the teaching approach. Due to slight variations in the highest possible total scores for the multiple choice item part for the 4 different sections (110, 115, 116, 114), the exam scores were expressed in percentages.

The total exam score mean for the traditional group was slightly higher than that of the PBL group. The Sum of Squares, which shows us where the variation in respondent answers occurs, show that the variation in exam scores was maybe due to random error, not to the teaching method. There was not a very strong relationship between the 2 variables of knowledge gain and the teaching method shown. Finally, the differences were not statistically significant.

The traditional group showed a statistically significant higher mean score than the PBL group's mean score in the multiple-choice items. The findings were slightly different with the short-answer part of the exam. The mean for the traditional group was slightly lower compared to the PBL group but showed no statistical significance.

These findings are in agreement to findings by the Albanese and Mitchell review (1993) which showed that PBL students tend to score lower on standardized exams that are said to measure only the "examinee's ability to recognize the correct answer from a limited list of potentially correct answers and of being heavily oriented toward recall" (Albanese and Mitchell, 1993, p.56), which is true with multiple choice item exams. It should be noted, however, that the multiple choice items in the Nursing 203 final examination were all case-based and required the student's ability to apply knowledge and principles in dealing with the situations presented.

Short answer type questions showed a slightly higher rating for the PBL group, although not statistically significant. These type of questions "require the student to create an answer rather than merely to recognize it" (Popham, 1978, p. 63). "...the kind of partial knowledge that might enable a student to get a correct answer in a selected-response test is insufficient for responding correctly to a short-answer item" (Popham, p.63).

The computer program was intended to measure the problem-solving skills of the students in terms of their decision-making and information gathering skills.The computer simulation rated the students for both their decision-making and information-gathering abilities separately. Although there was no statistically significant relationship shown between the students' problem-solving abilities and the teaching approach they were exposed to in Nursing 203, the PBL group showed slightly higher mean values compared to the traditional group in decision-making and information gathering.

The attitude and perception survey did not show statistically significant relationship between the variables from the survey and the teaching approach with the two groups of students, with the exception of Question 21, which asked the students if they actively

participated in class discussions. Students from the PBL group indicated that they felt they participated more in their class discussions more so than their counterparts in the traditional group.

Eighteen of the 54 students (33.3%) who completed the questionnaire said they had been previously exposed to the same teaching approach. This question was asked mainly to determine whether students from the PBL group had been previously exposed to PBL oriented approaches. The assumption was that all students had previously been taught by the traditional method of teaching. Since only three students from the PBL group answered "yes" to this question the researcher did not pursue further.

Comments written by 10 students (traditional=4, PBL=6) at the end part of the questionnaire expressed satisfaction and concerns directed to both of the teaching approaches. An interesting comment by one of the students in the PBL group was her appreciation of the fair amount of supervision and guidance she received in her class. Further comments were suggestions aimed at improvement of teaching strategies.

Efforts to statistically control the influence of variables such as age, previous education, previous work experience, previous health care experience, and previous GPA (grade point average) showed that these variables did not affect the significance of the relationships between the teaching approach and the dependent variables.

The overall survey findings, however, showed a certain direction of responses although not statistically significant. In most of the 28 variables used to determine attitudes and perceptions, students from the PBL group revealed a tendency to rate their experience with the teaching approach slightly more positively (17 out of the 28 variables) than did the students from the traditional group, as shown by the means. There were minimal differences in 4 of the variables between the two groups of students. The traditional group rated their experience slightly more positively than the PBL group in 7 variables. Overall, students in the PBL group showed a more consistent tendency towards rating their experience slightly more positively than did their counterparts in the traditional group.

DISCUSSION

The findings of the study were limited by the fact that the number of students from the total population (which began with a fairly low figure) who volunteered to do the computer simulation and complete the survey questionnaire was quite low. The researcher believes that statistical significance may have surfaced in the findings if both the computer program and the survey questionnaire were administered to a larger sample.

STUDENT LIMITATIONS

Despite the numerous times that contact was made with the students during the first and last month of Nursing 203 the returns came very slowly. Contact with the students was accomplished by way of researcher appearances during class times, phone calls, and student mail. The researcher attributes this slow response to the following:

1. End-of-course requirements, including the final exams, took priority of the students' time at the end of the course, although the computer simulation program was made available a month and a half before the final end of the course.
2. After the end of the university term exams, students were preoccupied with the Christmas season which fell very shortly after. A lot of the students took time off and away from the city during the season. Contact with the students was attempted again on the first week of January when the students were back in school. Three of the students asked to drop out of the study, and the rest either transferred to other faculty, dropped off the program, and one student moved to the U.S.A. The remaining students had to be contacted via phone and through the cooperation of the nurse educators in the next clinical course (Nursing 204) who provided some free time for the students to complete the study. This delay increased the time needed to collect the data for the study and may have slightly influenced the results of both the questionnaire and the computer program.

3. During conversations with participants over the phone and in person they indicated how they were bogged down with school workload during the past term which further interfered with their efforts to complete the computer program and the survey. This was a common complaint expressed by students in the program due to the clinical component of some of the nursing courses. Again this factor contributed to the increase in time delay.

FACULTY AND SYSTEM LIMITATIONS

The extent of how PBL was implemented in the individual classes could have been also affected by the individual educator's perception of what problem-based learning really entails. The limited extent to which the PBL group differed from the traditional group was shown in the description of the individual educator's approach. Perhaps the difference in the extent to which the difference would be possible was also limited by things like resources, individual course workload from separate courses, setting, faculty training, and faculty belief and commitment in the implementation of problem-based learning.

Support from the School of Nursing came in the form of class size determination for the course sections. Sections using the PBL approach were limited to a maximum class size of 24 students, and the traditional group sections had a maximum class size set at 32 students. Even with the PBL class sizes of 24 students each it would be hard to tutor small groups (ideally 5-6 per group) within the limits of the class time allotted for the course, which was two-1 hour & 50 minute sessions per week. The opportunity to facilitate the discussions would have been limited.

Introduction and training in the implementation of PBL were also made available to faculty by the school of nursing by holding workshops, inviting speakers from McMaster University, distribution of literature, encouraging collegial support and advice to novice PBL tutors from more experienced faculty, and sending interested faculty to tutoring workshops, mostly at McMaster University. Innovative teaching is encouraged by the school administration and the faculty is generally flexible and aware of new and more

liberal approaches. Previous experience and practice with actual implementation of problem-based learning in the classroom was still, however, generally limited.

Proponents of PBL maintain that standardized examinations "do not assess the study approaches aimed at the deep learning that PBL promotes" (Albanese and Mitchell, 1993, p.56). Evaluation methods to asses student performance and achievement in courses employing PBL should focus on problem-solving, clinical performance, student perception and self-evaluation, group cooperation and trust, and communication skills which are the focus of problem-based learning. The lack of statistically significant differences in the students' exam scores, problem-solving scores, and attitude and perception (with the exception of the multiple choice item test and class participation) perhaps imply some inability of the measurement tools employed in the study to measure the differences in the students' achievement.

An important aspect that should be looked at when measuring achievement, especially in PBL, is the clinical performance of students. Because of the way the grades are allocated in Nursing 203, the course grade of a student does not necessarily reflect his/her clinical performance, although passing the clinical component is required to pass the whole course. Albanese and Mitchell (1993), in their review, cite clinical ratings as shown in seven studies to be some of the strongest evidence in support of PBL (Albanese and Mitchell, 1993). This aspect might have shown differences between the PBL and the traditional group in this study as well.

OTHER LIMITATIONS

One of the limitations of the study, as mentioned in Chapter I, was the lack of baseline information regarding the students' problem-solving abilities that they came with to Nursing 203. One of the ways this information could have been obtained might have been through administering a written or computer simulated case to the students to evaluate their problem-solving skills at the beginning of the course. Another way could have been to look at the clinical evaluations done on these students on their past two clinical courses

(Nursing 104 and Nursing 107). Both ways would have involved an enormous time and task on both the researcher and the students. Concerns were with time restrictions, student commitment, confidentiality of records and student consent.

IMPLICATIONS

Heliker (1994) states: "For if the objective of nursing education is the development of a critically thinking reflective practitioner, the nursing community must review its present teaching strategies, outcomes, and existing educational philosophy in terms of teacher-student relationships, valued forms of knowing and learning, and society's expectation of the registered nurse" (Heliker, 1994, p.45).

This study shows that, at the least, problem-based learning is a viable alternate approach to the traditional lecture method when it comes to achievement gains such as knowledge gain and problem-solving skills. Students' attitude and perception towards PBL also showed that this approach evoke positive responses to learning. PBL by its nature offers numerous advantages to the nursing student by way of its emphasis on problem-solving, holistic approach, self-directed learning, team collaboration, listening skills, and interdisciplinary discussion (Heliker 1994). Aspects of patient care from assessment to discharge planning demand these abilities from the nurse and must be fostered and developed in our nursing students.

The study also probably supports the need for the incorporation of increased content (factual information) in problem-based learning, as indicated by the students' comments and lower scores of the PBL group in the multiple-choice portion of the final examination . Although the emphasis of problem-based learning is on the process of knowledge acquisition itself, some adjustments could be made into the approach to enable these students to be more competitive in standardized examinations, such as the licensing

examinations for registered nurses. This should be done carefully so that the advantages of self-directed learning are not minimized.

The difficulties encountered in the implementation of problem-based learning in individual tracks or courses may also indicate the need to broaden it curriculum-wide. This might result to increased collegial support, increased awareness and interest with the approach, increased commitment to the features that make it "problem-based learning", increase support for the changes needed in the present system to make it more conducive for self-directed learning and interdisciplinary sharing of resources and information. Educators in the clinical groups should also be involved in the implementation of the problem-based learning approach in Nursing 203. The approach could be practiced by promoting self-directedness and student input in the determination of post-conference topics and activities, client assignment, and alternate clinical activities. This would further enhance the advantages of problem-based learning.

Increased workload that is associated with independent student directed learning can evoke some negativism from students. Students, especially beginners, want to be assured of adequate instructor direction, guidance and factual information. This negativism was not indicated by the attitude and perception survey findings in this study. Perhaps an increase in confidence in the approach and tutoring skills of educators, plus the provision of introductory classes of the nature, advantages, etc. of PBL to students, might prevent this negativism in future efforts of initial implementation of the approach.

The expressed concern with instructor guidance from the written comments should be addressed by educators involved with PBL. Students should be made to feel that guidance is available when needed appropriately, regardless of the teaching approach employed. If we must trust students' self-directedness in determining their learning needs we must respond to what they express as their need.

The emphasis of PBL on increased student participation in learning tasks was shown by the students' perception of their level of participation in class work and discussion.

Students in the PBL group showed a significantly higher means in their perceived amount of participation in class discussion than their cohorts in the traditional group. The encouragement of team collaboration and sharing is one of the advantages PBL offers to learners in the nursing profession. Besides providing the opportunity to engage in cooperative activity, there is also the "opportunity for the sharing and integrating of personal experiences with the focus of the situation to promote the pursuit of particular meaning" (Weir, 1990, p.12). This group work experience prepares the nursing student for future professional settings where cooperation and collaboration are essential. Participation with the group work develops leadership and membership skills and attitudes, communication skills such as ability to listen, assertiveness, conflict resolution and negotiation, and providing feedback - skills that are necessary in dealing and interacting with both clients and colleagues. (Weir, 1990)

Nursing education must continue to look at the implementation of alternate approaches like problem-based learning in the preparation of nursing students. Its features offer numerous advantages to the learners of the nursing profession which will support them in interacting with and caring for their clients. The results of this study, although not statistically significant, indicate: a positive attitude of students toward the problem-based oriented approach of teaching, competitive level of problem-solving skills and knowledge gain. It might serve as encouragement to those who want to try and those who want to persist believing in the values of this teaching approach.

RECOMMENDATIONS FOR FURTHER RESEARCH

The following are recommendations for further research based on this study:

1. A replication of this study with a larger population to increase its useability to the general population of nursing students is recommended. Ideally it should involve most if not all of the total population in all aspects of the study. The study could also try to include the area of clinical performance as a measurement tool.The minimal amount of research done on the applicability of problem-based learning in nursing education supports this recommendation for further study.
2. A longitudinal study into the suggested advantages of problem-based learning should be pursued, preferably following the same sample of students from this study until one or two years after graduation. Aspects of the further study should again include areas like problem-solving skills, knowledge retention, and perceptions of the teaching approach after exposure to the work setting. It may also look into efforts and tendencies for lifelong learning in these graduates.
3. Further investigation into evaluation and measurement tools that are appropriate for the type of learning that PBL offers should be done. These could include clinical performance evaluations and ratings.
4. Studies on ways of increasing content coverage in problem-based learning is recommended. This has been an expressed concern among students and is confirmed by studies in Albanese and Mitchell's review.
5. The perceptions of faculty employing the problem-based learning approach should be further researched. Areas like the nature and amount of "guidance" afforded to students and faculty satisfaction with the approach should be examined more closely.

CONCLUSION

"Nursing is a practice-based profession and, if nurses are to function effectively, their education must be grounded in and derived from that practice" (Townsend, 1990, p.61). Functioning effectively as a nurse entails the development of clinical decision-making, approaching care in a holistic point of view, self-directedness, team collaboration, effective communication skills, and interdisciplinary sharing (Heliker, 1994, p.46). Nurse educators must respond appropriately with awareness of and willingness to employ alternate teaching approaches, such as problem-based learning, which aim to facilitate the process and efficiency of learning by placing learning in the context to which it will be used.

Innovations in teaching our nursing students are evident in some recent efforts in multiple settings of education. An ongoing research project at the University of Alberta Hospitals School of Nursing in Edmonton, Alberta, the Alternate Instructional Project, is working towards the implementation of problem-based learning in all of the first year level nursing courses at this site. In this project the PBL track would be offered parallel to the traditional track to the first year level students beginning September 1995. The findings, experiences, and recommendations from this thesis were shared in the planning and design of this project. The general trend of innovative thinking as educators, high level of awareness among the faculty, strong support from administration, and collaborative work between administration and faculty have all provided impetus to the development of the project.

A change in way of thinking as nurse educators is needed as we try to address the changing needs of our learners. "As we help students explore their future, we will inevitably explore our own. We need to appreciate where we are and how we got here. The challenge of a new way of thinking is not a call to abandon cherished values that have provided meaning and direction. Rather it is a challenge to participate in creating a new

vision of our role as humans and in educating students to achieve that potential" (Crowell, 1989, p. 63).

References

Albanese, M.A. and Mitchell, S. (1993). Problem-based Learning: A Review of Literature on Its Outcomes and Implementation Issues. Academic Medicine. 68(1), 52-81.

American Psychological Association. (1994). Publication manual of the American Psychological Association (4th ed.). Washington, DC: Author.

Barrows, H.S. (1986). A taxonomy of problem-based learning methods. Medical Education. 20, 481-486.

Barrows, H.S. (1985). How to Design a Problem-Based Curriculum for the Preclinical Years. Springer: New York.

Barrows, H.S. (1988). The Tutorial Process. Springfield, IL: SIU School of Medicine.

Barrows, H.S., and Tamblyn, R.M. (1980). Problem-Based Learning, An Approach to Medical Education. Springer: New York.

Borg, W.R., Gall, J.P., and Gall, M.D. (1993). Applying Educational Research: A Practical Guide. (3rd ed.) Longman: New York.

Boud, D., Feletti, G. (1991). The Challenge of Problem-based Learning. London: Kogan.

Coles, C.R. (1985). Differences between conventional and problem-based curricula in their students' approaches to studying. Medical Education. 19, 308-309.

Crowell, S. (1989). A New Way of Thinking: The Challenge of the Future. Educational Leadership. 47(1), 60-63.

D'A Slevin, O., & Lavery, M.C. (1991). Self-directed learning and student supervision. Nurse Education Today. 11, 368-377.

Davis, W.K., Nairn, R., Paine, M.E., Anderson, R.M., Oh, M.S. (1992). Effects of Expert and Non-expert Facilitators on the Small-group Process and on Student Performance. Academic Medicine. 67(7), 470-474.

DeYoung, S. (1990). Teaching Nursing. Addison-Wesley Nursing: New York.

Des Marchais, J.E., Bureau, M.A., Dumais, B., & Pigeons, G. (1992). From traditional to problem-based learning: a case report of complete curriculum reform. Medical Education. 26, 190-199.

Dolmans, D.H.J.M., Gijselaers, W.H., Schmidt, H.G., Van Der Meer, S.B. (1993). Problem Effectiveness in a Course Using Problem-based Learning. Academic Medicine. 68(3), 207-213.

Eagle, C.J., Harasym, P.H., Mandin, H. (1992). Effects of Tutors with Case Expertise on Problem-based Learning Issues. Academic Medicine. 67(7), 465-469.

Engel, C.E. (undated). Problem-solving, Problem-Based, Problem-Centred and all that.... Center for Medical Education, Research and Development Newsletter. The University of New South Wales and World Health Organization Regional Teacher Training Centre for Health Personnel.

Feletti, G. (1993). Inquiry Based And Problem Based Learning: How Similar are these Approaches to Nursing and Medical Education. Higher Education Research and Development. 12(2), 153-156.

Ferrier, B.M., (1990). Problem-based Learning: Does it Make a Difference? Journal of Dental Education. 54(9), 550-551.

French, S. (1989). Student Centered Learning. Physiotherapy. 75(11), 678-680.

Hanna, D.R. (1991). Using simulations to teach clinical nursing. Nurse Educator. 16(2), 28-31.

Heliker, D. (1994). Meeting the Challenge of the Curriculum Revolution. Journal of Nursing Education. 33(1), 45-47.

Iwasiw, C. I. (1987). The role of the teacher in self-directed learning. Nurse Education Today. 7, 222-227.

Kaufman, D. (1994). Implementing a Problem-Based Learning Curriculum in a Professional School. Presented at the 14th Annual Conference on Teaching & Learning in Higher Education. Vancouver, B.C., June 15-18, 1994.

Kennedy, S.W., & Wilkerson, L. (1993). Students' Perceptions of Problem-Based Learning. Academic Medicine. 68(10), S31-S33.

Klaassens, E. (1992). Strategies to Enhance Problem Solving. Nurse Educator. 17(3), 28-31.

Kruse, M. (undated). An Unpublished Paper. Medi-Sim/Williams & Wilkins Electronic Media: Baltimore, Maryland.

Leedy, P.D. (1989). Practical Research. (3rd ed.). Macmillan Publishing Company: New York.

Lewis, K. E. & Tamblyn, R.M. (1987). The Problem-Based Learning Approach in Baccalaureate Nursing Education: How Effective Is It ? Nursing Papers. 19 (2),

Locke, L.F., Spirduso, W.W., & Silverman, S.J. (1987). Proposals That Work. Sage Publications: Newbury Park, California.

Mennin, S.P., Friedman, M., Skipper, B., Kalishman, S., Snyder, J. (1993). Performances on the NBME I, II, and III by Medical Students in the Problem-based Learning and Conventional Tracks at the University of New Mexico. Academic Medicine. 68(8), 616-624.

Mennin, S.P., & Martinez-Burrola, N. (1986). The cost of problem-based vs traditional medical education. Medical Education. 20, 187-194.

Morrison, J.M. & Murray, T.S. (1994). An experiment in problem-based learning. Medical Education. 28, 139-145.

Muller, S. (1984). Physicians for the twenty-first century: report of the project panel on the general professional education of the physician and college preparation for medicine. Journal of Medical Education. 59 (2).

Neufeld, V.R. & Barrows, H.S. (1974). The 'McMaster Philosophy': An Approach to Medical Education. Journal of Medical Education. 49, 1040-1050.

Norman, G.R. & Schmidt, H.G. (1992). The Psychological Basis of Problem-Based Learning: A review of the evidence. Academic Medicine. 67(9), 557-565.

Norman, G.R. (1988). Problem-solving skills, solving problems and problem-based learning. Medical Education. 22, 279-286.

Popham, J. W. (1978). Criterion-Referenced Measurement. Prentice-Hall, Inc.: Englewood Cliffs, New Jersey.

Richardson, M. (1988). Innovating andragogy in a basic nursing course: an evaluation of the self-directed independent study contract with basic nursing students. Nurse Education Today. 8, 315-324.

Roberts, J.D., White, A.E., & Fitzpatrick, J.M. (1992). Simulation: current status in nurse education. Nurse Education Today. 12, 409-415.

Rouse, M.W. (1990). Problem Based Learning: An Alternative to Traditional Education. Journal of Optometric Education. 15(4), 111-112.

Schmidt, H.G. (1983). Problem-based learning: rationale and description. Medical Education. 17, 11-16.

Schmidt, H.G., Van Der Arend, A., Moust, J.H.C., & Boon, L. (1993). Influence of Tutors' Subject-matter Expertise on Student Effort and Achievement in Problem-based Learning. Academic Medicine. 68(10), 784-791.

Shahabudin, S.H. (1987). Content coverage in problem-based learning. Medical Education. 21, 310-313.

Student Evaluation of Courses and Instruction using the Instructor Designed Questionnaire (IDQ) System with the CITL Catalog. Office of the Committee for the

Improvement of Teaching and Learning and Department of University Computing Systems. University of Alberta. Edmonton.

Thiele, J.E., Holloway, J., Murphy, D., Pendarvis, J., Stucky, M. (1991). Perceived and Actual Decision Making by Novice Baccalaureate Students. Western Journal of Nursing Research. 13(5), 616-626.

Tolnai, S. (1991). Continuing medical education and career choice among graduates of problem-based and traditional curricula. Medical Education, 25, 414-420.

Townsend, J. (1990). Problem-Based Learning. Nursing Times. 86(14), 61-62.

Townsend, J. (1990). Curriculum Design. Nursing Times. 86(18), 60-62.

Townsend, J. (1990). Teaching/Learning Strategies. Nursing Times. 86(23), 66-68.

Vasconez, H.C., Donnelly, M.B., Mayo, P., & Schwartz, R.W. (1993). Student Perceptions of the Effectiveness of a Problem-based Surgery Curriculum. Academic Medicine. 68(10), 528-530.

Vernon, D.T., Blake, R.L. (1993). Does Problem-based Learning Work ? A Meta-analysis of Evaluative Research. Academic Medicine. 68 (7), 550-563.

Walton, H.J., & Matthews, M.B. (1989). Essentials of problem-based learning. Medical Education. 23, 542-558.

Webber, R.H. (1992). Structured short-answer questions: an alternative examination method. Medical Education. 26, 58-62.

Weir, J. (1990). Problem/Situation Based Learning. Thesis. Author.

Wertenberger, D.H. (1992). Introduction to Problem-based Learning. (Video). University of Alberta Hospitals School of Nursing. Edmonton.

Wilkerson, L.A., & Feletti, G. (1989). Problem-Based Learning: One Approach to Increasing Student Participation. New Directions for Teaching & Learning. 37.

APPENDIX A

SAMPLE QUESTIONS FROM THE NURSING 203 TEST BANK

NURSING 203 TEST BANK

SAMPLE QUESTIONS

The following are sample of questions from the Nursing 203 Test Bank that will be used in the final exams:

QUESTIONS 1 TO 7 REFER TO THIS SITUATION:

Mr. Peter Davis is a 50 year old married oil field manager from Leduc, with a 10 year history of controlled hypertension. Two weeks ago Mr. Davis was notified from the company head office that a production cutback was in effect and that 25% of Mr. Davis' employees would need to be laid off over the next 2 to 3 months. This has caused him a great deal of stress. He starts to experience pain in his left shoulder and wrist, and pressure in the anterior chest. Since his hypertension was diagnosed, he has also been concerned about his cigarette consumption and his serum lipid levels. Mr. Davis is admitted for investigation of his chest pains.

1. Risk factors have been identified and well documented in relation to coronary artery disease. The priority for teaching Mr. Davis should focus on:

   a. low cholesterol diet and positive family history.
   b. dietary habits and cigarette smoking.
   c. low cholesterol diet and stress.
   d. physical activity and hypertension

2. Mr. Davis is diagnosed by his physician as having angina pectoris. Mr. Davis is prescribed Nitroglycerine (vasodilator). He should be instructed to take his medication:

   a. in anticipation of any activity that may produce pain.
   b. prior to going to bed in case angina occurs while asleep.
   c. whenever he can think of a stressful situation.
   d. after chest pain increases steadily, and is maintained.

Mr. Davis continues to have severe chest pain unrelieved by the nitroglycerine. He is transferred to the coronary care unit (CCU) for observation and treatment. Mr. Davis is diagnosed as having an acute myocardial infarction.

3. In planning nursing care for Mr. Davis, what is the nurse's priority?

   a. Decrease myocardial demand for O2 and increase O2 supply.
   b. Monitoring fluid intake to prevent overhydration.
   c. Monitor cardiac status for stability.
   d. Prevention and management of anxiety.

APPENDIX B

SAMPLE OF SHORT-ANSWER QUESTIONS FOR THE FINAL EXAMS

SAMPLE OF SHORT-ANSWER TEST QUESTIONS THAT WILL BE INCLUDED IN THE FINAL EXAMS

Answer the following problems briefly and concisely:

1. Explain the causes of hypoglycemia.

2. Identify 3 factors causing hypoglycemia.

3. Develop a brief plan to prevent episodes of hypoglycemia on your clients.

APPENDIX C

COMPUTER SIMULATION SAMPLE QUESTION

SAMPLE QUESTION FROM THE COMPUTER SIMULATION

"AN ADULT INSULIN-DEPENDENT DIABETIC"

CLINICAL SIMULATION IN NURSING II - 2ND EDITION

MEDICAL-SURGICAL NURSING SERIES

MEDI-SIM, WILLIAMS & WILKINS ELECTRONIC MEDIA

Situation: You are the nurse in an adult ambulatory clinic. Susan Gilbert, age 40, an insulin-dependent diabetic for 6 years, has been added to your case load. Her last visit was 1 year ago and the chart indicates that she was not always in good control. She lists her occupation as housewife and works part-time as a receptionist at a day-care center.

As always, you have a number of clients scheduled this morning. Your time to collect the data needed to plan and implement appropriate care for Ms. Gilbert is limited to 30-45 minutes.

Ms. Gilbert indicates that her reason for this visit is to get a checkup. She has already blood drawn for labs.

To assess Ms. Gilbert's current status, you may collect data from a general interview or from her chart and other clinical records. Your time is somewhat limited. Select the questions most important to obtain the data you need to make your nursing diagnosis.

Make selections one at a time. Select as many as appropriate.

1) "Why did you come to the clinic today?"
2) "What medications are you taking?"
3) "What kind of diet do you follow?"
4) "Tell me about your family."
5) "What have you been taught about how to manage your diabetes?"
6) "Have you had any illnesses since your last visit?"
7) "How would you rate your diabetic control?"
8) "What do you do for relaxation?"
9) "How often do you test your urine or blood sugar?"
10) "Do you drink alcohol?"
11) "Do you smoke?"
12) "How often do you see the dentist?"
13) "Tell me about your general exercise plan at home."
14) "When was the last time you visited the podiatrist?"

APPENDIX D

COMPUTER SIMULATION SCORING ASSIGNMENT

COMPUTER SCORE ASSIGNMENT

The computer will assign the following scores based on the selections made by the examinee:

3	=	critical steps or information needed in life-threatening situations
3 minus	=	life threatening steps/mistakes
2	=	not critical, but steps that should be done, important information
2 minus	=	not life-threatening but should not be done
1	=	nice to do but not essential
1 minus	=	not entirely negative but not really helpful at this time

For example, the different scores, feedback, and client responses on the selections given on the sample question in Appendix A would be:

1) "Why did you come to the clinic today?"
   - **Important information** - Ms. Gilbert says "I have not been feeling well and have had some insulin reaction at work. I get sweaty and my hands get numb. I thought I should get it checked out."
   - **Score: 2**.

2) "What medications are you taking?"
   - **Important** - Ms. Gilbert takes 28 units of Humulin N insulin and 12 units of Humulin R insulin between 7 AM and 8AM each day. She takes multivitamins and calcium daily.
   - **Score: 2**

3) "What kind of diet do you follow?"
   - **Very good** - Ms. Gilbert says, "I don't follow a special diet, but I do try not to eat sweets or overeat."
   - **Score: 2**

4) "Tell me about your family."
   - "My husband works for a local auto manufacturing company and my daughters, ages 18 and 22, live at home and attend college." This is **not essential information** for initial assessment.
   - **Score: -1**

5) "What have you been taught about how to manage your diabetes?"
   - **Good** - Ms. Gilbert says, "Six years ago, when I was told I had diabetes, they gave me handouts, showed me how to give myself insulin, and gave me a Medic Alert bracelet."
   - **Score: 2**

6) "Have you had any illnesses since your last visit?"
   - **Important** - Ms. Gilbert says, "I had several urinary tract infections and I have noticed that I have had trouble getting over several colds."
   - **Score: 2**

7) "How would you rate your diabetic control?"
- This is **somewhat important** - Ms. Gilbert says, "OK, I guess. On a scale of 1-10, about a 7."
- **Score: 1**

8) "What do you do for relaxation?'
- "I like to work in the yard in the spring and summer and to read or knit when it is cold. I'm sort of a 'homebody', I guess." This **not essential** information.
- **Score: -1**

9) "How often do you test your urine or blood sugar?"
- **Good** - Ms. Gilbert says, "I don't recall the last time I tested my urine. I have some tablets somewhere, but I don't use them. I've never tested my blood at home."
- **Score: 2**

10) "Do you drink alcohol?"
- "I enjoy a glass of wine on special occasions." The chart indicates that Ms. Gilbert is only a social drinker. This is **not essential** information at this time.
- **Score: -1**

11) "Do you smoke?"
- "I smoked a pack of cigarettes a day until a year ago." This is **not the most important** information for initial assessment.
- **Score: -1**

12) "How often do you see the dentist?"
- This is **not essential**. "I have my teeth cleaned and checked once a year. We have dental insurance."
- **Score: -1**

13) "Tell me about your general exercise plan at home."
- "I don't have a specific exercise plan," says Ms. Gilbert. "I bought a stationary bicycle that I use occasionally. I get my exercise around the house." This is **helpful information.**
- **Score: 1**

14) "When was the last time you visited the podiatrist?"
- This is **not essential** for initial assessment. Ms. Gilbert says, "I've never been to a podiatrist. My feet don't give me any problem."
- **Score: -1**

APPENDIX E

QUESTIONNAIRE

Date: December 1, 1994

Dear Student:

The following is a two-part survey questionnaire as part of the study you are currently involved in. Your response to this questionnaire is completely voluntary and will be completely confidential as is the rest of your participation in the whole study. You are asked not to sign your name but are assigned a Research ID Number.

In order to assure you of total confidentiality, when you have completed the questionnaire, hand it to a designated member of your group who will seal it in the envelope provided and give it to the course nurse educator or researcher at the School of Nursing. Only the researcher will be able to view the completed questionnaires.

Mila G. Newman
Researcher
Phone: 437-1026

SURVEY QUESTIONNAIRE

This questionnaire was designed to collect the demographic data necessary to describe the groups selected for the study you are currently involved in and to determine the attitudes and perceptions students have of the particular teaching approach they were exposed to in the course.

Your participation in this survey would be greatly appreciated and is considered important. The information collected will be kept strictly confidential. To help maintain confidentiality I would ask that you place the completed questionnaire in the brown envelope provided, seal it, and submit to the course nurse educator. By using only your research ID number, your anonymity is guaranteed. Your involvement in this study is purely voluntary. Again, I would like to thank you for your cooperation.

PLEASE DISREGARD THE NUMBERS IN THE RIGHT MARGIN

My research number : _____ ____ 1 - 4

PART I : BACKGROUND INFORMATION
****

Please complete the following statements by checking or filling in the appropriate blanks.

1. My age : _____ ____ 5 - 6

2. My gender : ____1. Male
____2. Female ____ 7

3. Marital Status : ____1. Single
____2. Married
____3. Other: _____ ____ 8

4. Dependents : ____1. Yes
____2. No
Number : _____ ____ 9

5. Permanent Address :
   ____1. Edmonton
   ____2 Alberta, other than Edmonton
   ____3. Other Province Please specify : _____
   ____4. Other Country Please specify : _____ ____ 10

6. Previous Education prior to entering program:

   ____1. College or Technical Institution
   ____ 1. Yes
   ____ 2. No ____ 11

   Area of Study _____
   ____ A. Diploma or Certificate Granted
   ____ B. Program not completed ____ 12

   ____2. University
   ____ 1. Yes
   ____ 2. No ____ 13

   Area of Study _____
   ____A. Degree granted
   ____B. Program not completed ____ 14

   ____3. No post-secondary
   ____. 1. Yes
   ____ 2. No ____ 15

7. Advanced Credit for courses taken prior to entering the program:
   ____1. Yes
   ____2. No ____ 16

8. Previous Paid Work Experience:
   ____1. Yes
   ____2. No ____ 17

   If your answer is yes, please select one of the following.
   ____A. Less than 6 mos
   ____B. 6 - 12 mos
   ____C. 1 - 5 yrs
   ____D. 5 - 10 yrs
   ____E. 10 yrs + ____ 18

9. Previous Paid Health Care Experience: ____1. Yes
___2. No

19

If your answer is yes please select one of the following.
____A. Registered Nursing Assistant
____B. RPN (Registered Psychiatric Nurse)
____C. Personal Care Attendant

20

10. I have encountered a similar situation as the computer simulation used in the study in previous clinical situations.
____1. Yes
____2. No

21

11. I have been exposed to this approach in previous courses.
___1. Yes
___2. No

22

12. I was in a Nursing 203 group of my choosing.
___1. Yes
___2. No

23

13. I was aware of the teaching approach to be used in the course section prior to registration.
___1. Yes
___2. No

24

PART II: ATTITUDE /PERCEPTION SURVEY

****

Please circle the number which expresses the extent to which you agree with each statement.

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly Agree

1.	I enjoyed this method of instruction.	1 2 3 4 5	25
2.	I found it easy to learn new material with this method.	1 2 3 4 5	26
3.	This approach provides for great retention of learned material.	1 2 3 4 5	27
4.	I would have no difficulty using this method for other areas.	1 2 3 4 5	28
5.	I found this approach more effective than other methods.	1 2 3 4 5	29
6.	I found this method of learning flexible enough for my schedule.	1 2 3 4 5	30
7.	I was satisfied with the teaching approach used in my group.	1 2 3 4 5	31
8.	I felt that I was performing up to my potential in this course.	1 2 3 4 5	32
9.	I learned a good deal of factual material in this course.	1 2 3 4 5	33
10.	I gained a good understanding of concepts/principles in caring for the elderly adult and family.	1 2 3 4 5	34
11.	I learned to apply principles from this course to new situations.	1 2 3 4 5	35
12.	I learned to identify main points and central issues in this field.	1 2 3 4 5	36
13.	I developed the ability to solve real problems in this field.	1 2 3 4 5	37
14.	I learned a lot in this course from the instructor.	1 2 3 4 5	38
15.	I learned more in this course than in most other courses.	1 2 3 4 5	39

16.	I put more effort into this course than into most other courses.	1 2 3 4 5	40
17.	I deepened my interest in the subject matter of this course.	1 2 3 4 5	41
18.	I developed enthusiasm about the course material.	1 2 3 4 5	42
19.	I was stimulated to do outside reading about the course material.	1 2 3 4 5	43
20.	This method challenged me intellectually.	1 2 3 4 5	44
21.	I actively participated in class discussions.	1 2 3 4 5	45
22.	I attended class regularly.	1 2 3 4 5	46
23.	I utilized all the learning opportunities provided.	1 2 3 4 5	47
24.	I created my own learning experiences in connection with the course.	1 2 3 4 5	48
25.	I helped classmates learn.	1 2 3 4 5	49
26.	Class time was used well.	1 2 3 4 5	50
27.	The objectives of the course were achieved.	1 2 3 4 5	51
28.	The type of assigned work was appropriate to the goals of the course.	1 2 3 4 5	52

Comments

APPENDIX F

LETTERS

LETTER TO NURSING 203 EDUCATORS

3011 - 105 Street
Edmonton, Alberta
T6J 2Z7

August 15, 1994

Ms. _____
Nurse Educator
University of Alberta Hospitals
School of Nursing
Edmonton, Alberta

Dear Ms. _____,

Following our conversation regarding my research study I would like to iterate the following:

a) The study that I propose to do will determine the differences, if any, between the knowledge gain and problem-solving skills of students taught by two different teaching approaches. Towards this the mean scores in the final exams in Nursing 203 and the scores in a computer simulation of a clinical situation from the two groups of students will be compared. In addition a survey questionnaire will be administered at the end of the course to gather demographic data and to determine student satisfaction toward the teaching approach they were exposed to. The responses from the questionnaires will also be compared between these groups of students.

b) I would like your permission to access the students during class times at the second week of classes to present my study to them. At this time I will explain the purpose of my study and the methodology, ask for their participation, and inform them of the voluntary nature of their participation. Confidentiality of their responses will be assured. I will contact you in the future to determine a specific date for this presentation.

c) I would like to request that you view the computer simulation "An Adult Insulin-Dependent Diabetic" (Clinical Simulations in Nursing II-2nd Edition from Medi-Sim) at the Media Resource Center in our school before the initiation of the study and provide feedback to me. The other Nursing 203 educators are also asked to view this Computer program independently. This step is necessary to establish content validity.d) As the researcher I propose to construct the final exam for the course and ask that the four Nursing 203 educators review this exam and also provide feedback. The final exam will be composed of two parts: multiple-choice items and short answer items. The multiple-choice part will be marked by computers as usual but the short answer items will be marked by the educators. Exam papers will be assigned at random to the educators for marking to control bias. The researcher will review the marked papers as well before they are handed back to students.

I hope that these proposed arrangements are acceptable to you. I greatly appreciate your expressed willingness to support the study. If you have any questions, please feel free to contact me. I will inform you promptly of any changes that may occur.

Sincerely,

Mila Newman
Researcher

LETTER REQUESTING PERMISSION FROM THE DIRECTOR OF THE UNIVERSITY OF ALBERTA HOSPITALS SCHOOL OF NURSING

June 10, 1994

Dr. Dana H. Wertenberger
Director - School of Nursing
University of Alberta Hospitals
Edmonton, Alberta

Dear Dr. Wertenberger,

As a graduate student in the master's degree program at the University of Alberta Faculty of Education, I am at the stage of designing a research proposal for a study that would compare outcomes of a modified problem-based learning approach to the lecture method or conventional instruction. The study would involve nursing students at the UAH School of Nursing who are enrolled in Nursing 203, Nursing Care of Individuals Within Families. The same study proposes the use of the following instruments/tools to gather data: 1) mean scores from the final exams in NURS 203, 2) a computerized simulation of a patient case scenario, and, 3) a survey questionnaire that will gather demographic data and student perceptions towards the teaching approach they were exposed to.

The final exams will be constructed by the researcher and reviewed by the course nurse educators. The computer simulation will need independent viewing of the nurse educators as well. Verbal arrangements with the nurse educators will be made either individually or through a group meeting prior to a formal letter requesting their cooperation and outlining their role in the study. In addition I will need to access students during class times to ask for their volunteer participation and to discuss the purpose of my study. It will be emphasized that participation for the computer simulation will require use of their own time. Lastly, the study will also require use of the resources of the Media Center, including staff effort and time.

As a member of the School of Nursing faculty, I will be supervising at least 8 of these students in the clinical area but will not have any direct input or influence into the class sessions themselves. However, I am aware that possible bias may occur as a result of my supervision of their learning in the clinical area. This will be further acknowledged in the study itself.

I am hereby requesting for your permission to conduct this study as presented above, pending approval by the Joint Ethics Review Committee of the University of Alberta Faculty of Nursing and the University of Alberta Hospitals. I would also appreciate any further discussions and input from you with any aspect of the proposed study.

Thank you for your kind attention.

Sincerely,

Mila G. Newman
Nurse Educator

university of Alberta hospitals

8440 - 112 Street
Edmonton, Alberta
Canada T6G 2B7
(403) 492-8822

21 June 1994

Mrs. Mila G. Newman
Nurse Educator
University of Alberta Hospitals
School of Nursing
Edmonton, Alberta
T6G 2B7

Dear Mila:

RE: Request for Research Access

Your request of June 10, 1994 for access to students at the University of Alberta Hospitals School of Nursing for the purpose of thesis research can be supported under the following conditions:

1. Your thesis proposal receive appropriate review and acceptance by ethics review committee.

2. Letters requesting access to students and faculty are appropriately reviewed.

3. Responses to the research be made available to participants and to other members of the School of Nursing.

Once ethical clearance has been obtained, please contact me with that information so that further procedures for access can be implemented.

Good luck with your study.

Sincerely,

Dana Hames Wertenberger

Dana Hames Wertenberger, PhD, RN, C
Director
School of Nursing

DHW/ble

Walter C. Mackenzie Health Sciences Centre

Aberhart Centre

Mewburn Veterans Centre

University Hospitals Outpatient Residence

University Hospitals Education and Development Centre

ersity Hospitals
ent Support Centre

3830-05774-Apr 89

Williams & Wilkins

A WAVERLY COMPANY

Wednesday, August 10, 1994

Mila G. Newman
3011-105 Street
Edmonton, Alberta
Canada, T6J 2Z7

Dear Ms. Newman,

Thank you for your interest in using Williams & Wilkins/Medi-Sim educational resources as part of your master's research study. Williams & Wilkins recognizes the value of your research effort and proudly grants permission for you to use the computer simulation entitled "An Adult Insulin-Dependent Diabetic," Clinical Simulation in Nursing II, 2nd Edition, Medical-Surgical Nursing Series as part of your research.

Please contact me at (410)528-8589 if there are any questions regarding this permission. Thank you again for your interest in Medi-Sim computer assisted instruction for nursing.

Sincerely,

Jason A Pointe

Jason A. Pointe
Account Manager

428 East Preston Street, Baltimore, Maryland U.S.A. 21202-3993 410-528-4000 Fax 410-528-4414 Telex 87669 Cable WILCO

The Global Information Resource for Medicine and the Health Sciences

University of Alberta
Edmonton
Canada T6G 2G3

Faculty of Nursing
Office of the Dean
Third Floor Clinical Sciences Building, Telephone (403) 492-6236
Fax (403) 492-2551

August 31, 1994

Mrs. Mila G. Newman
Nurse Educator
University of Alberta Hospitals
School of Nursing
Edmonton, Alberta
T6G 2B7

Dear Mrs. Newman:

The Joint Ethics Review Committee, a joint Committee of the Faculty of Nursing, University of Alberta and the Division of Nursing, University of Alberta Hospitals, met August 29, 1994 to review your research proposal. It was determined that your proposal does not require ethical approval but does requires access approval so that you may approach students from the Faculty of Nursing at the University of Alberta to participate in your thesis research.

I have reviewed your Ethics Review Proposal and grant you permission to access Faculty of Nursing students as outlined in your proposal.

Good luck with your study.

Sincerely

Marilynn J. Wood, DrPH, RN
Dean and Professor

MJW:sk

FACULTY OF NURSING U O TEL:403-492-8233 Sep 02 94 9:47 No.003 P.01

APPENDIX G

CONSENT FORM

CONSENT FORM

PROJECT TITLE:
A comparison of nursing students in different teaching approaches.

INVESTIGATOR:
Mila G. Newman
Master of Education Student
Faculty of Education
Department of Adult Education
University of Alberta
Phone: 437-1026

SUPERVISOR:
Dr. Dave Collett
Professor
Faculty of Education
Department of Adult Education
University of Alberta
Phone: 492-5621

PURPOSE:
This study will compare the factual knowledge gain and problem-solving skills of nursing students who will be taught by different teaching approaches. The level of satisfaction towards the particular teaching approach will also be determined and compared to the knowledge gain and problem-solving skills of these groups of students.

PROCEDURE:
Mean scores from the final exams in Nursing 203 between the groups of students participating will be used. This exam will be composed of both multiple-choice items and short answer items. The students will also be asked to problem-solve through a computer simulation of a patient care scenario. A survey questionnaire to gather demographic data and student satisfaction towards the teaching approach will also be taken towards the end of the course.

PARTICIPATION: There will be no harm to you if you participate in this study, nor will you benefit directly from this study. Results from this study may help nurse educators to determine appropriate teaching approaches. These teaching approaches aim to develop the skills and competencies nursing students must learn to take care of increasingly complex patient needs. This may help to improve the care that nurses give to patients.

You do not have to be in this study if you do not wish to be. If you decide to be in the study, you may drop out at any time by telling the researcher. Taking part in this study or dropping out will not affect your status in the course.

Your name will not appear in this study. Only a code number will appear on any forms or question sheets. All records will be kept in a locked cabinet separate from consent forms or code list which will be stored for five years after completion of the study and destroyed after. Data may be used for another study in the future, if the researcher receives approval from the appropriate ethical review committee.

The information and findings of this study may be published or presented at conferences, but your name or any material that may identify you will not be used. If you have questions or concerns about this study at any time, you can call the researcher at the number above.

This study has received approval from the appropriate ethical review committees. Permission has also been given by the School of Nursing administration to conduct this study.

CONSENT:
I acknowledge that the above research procedures have been described. Any questions have been answered to my satisfaction. In addition, I know that I may contact the person named below, if I have further questions either now or in the future. I have been informed of the alternatives to participating in this study. I understand the possible benefits of joining the study, as well as the possible risks and discomforts. I have been assured that records relating to this study will be kept confidential. I understand that I am free to withdraw at any time. I further understand that if I do not participate in the study or withdraw at any time, my status in the course will not be affected. I understand that if any knowledge from the study becomes available that could influence my decision to continue in this study, I will be informed promptly. I have been given a copy of this form to keep.

_____ _____

(Signature of Participant) (Date)

_____ _____

(Signature of Researcher) (Date)

REQUEST FOR SUMMARY:

If you wish to receive a summary of the study when it is finished, please complete the next section:

Name: _____

Address: _____

APPENDIX H

STUDENT COMMENTS IN THE ATTITUDE/PERCEPTION SURVEY

STUDENT COMMENTS

TRADITIONAL GROUP

1. "I find a fairly structured format with overheads is effective only when the overheads include only very brief, main points.....
   - "...this class was conducive....to discussion and participation although it seemed there were very few people who participated in class discussion."
2. "There just doesn't seem to be enough time to learn everything in the time frame that's given. That goes for most nursing courses but especially in 203 because it's such a broad course."
3. "I know that lecture form is the most useful to teach a large amount of info to a large group. However, I find it a difficult method to retain information. Also I found the information learned in the lectures not that useful when it came to the midterm or final. I tried to draw on lecture info and found it confused me during the exam and was not useful. When I approached the proctor of the final exam I was told not to 'read into the questions'. Now if the lectures were at all helpful I would not have to read into the questions to try to deci(pher) the answer to the questions. OR it could have been a poorly worded exam. Either way overall I was very disappointed in Nurs. 203 lectures."
4. "There was too much material to learn in this course for such short classes. Having hand-outs would aid in learning rather than having to take tons of notes each day."

PROBLEM-BASED LEARNING GROUP

1. "This was a good course but the work load was very heavy. I did learn a lot and I think the clinical class component was very effective."
2. "I enjoyed the case studies and did pick up some main points, but I would have learned better if there was more lecture notes for me to review important aspects, instead of sometimes guessing at what was most important to remember. A 1/2 hour spent on case study would be excellent to let you see how one individual reacted after you have had a general overview of the situation or disease."
3. "In the beginning it was hard to answer the case studies but I found I benefited because this course and patho were close together. Without the connection between the two courses I do not feel that I would have learned as much from the case studies but with the connection I feel that I learned a lot."

4. "Should have been more work for a course of this weight (in classroom)."
5. "It helps to consolidate new concepts by going through scenarios. "
   - "Case study hand-outs were ok, but if they were not discussed in class, it's hard to fully complete all the answers and know if they are correct. So an answer sheet for these, perhaps in the Media Center would be helpful."
   - "I find it very helpful to have active teacher participation and guidance. Having the instructor guide my learning and clarify information is, for me, the best way to learn."
   - "The problem-based method probably has its merits - especially in higher level courses, but for a course in basic nursing I believe that the "traditional" classroom approach is more appropriate."
6. "A better balance of lecture and case studies would have been more effective. Perhaps handing out the case studies prior to the next class so we could read and research with a problem/challenge in mind then using part of the next class for lecture, 30 min. to 1 hour, then a discussion of the case study. I believe more work/effort and content would've been learned and this course experience would been more beneficial. It's unfortunate that now, after completing this course I feel as though there are many things I must go back and relearn content before I write my final."

APPENDIX I

SAMPLE OF CASE SCENARIOS

USED IN THE PBL GROUP

UNIVERSITY OF ALBERTA HOSPITALS SCHOOL OF NURSING
a joint department of
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and
UNIVERSITY OF ALBERTA HOSPITALS

NURS 203 CASE STUDY #4

Mike is an 20 year old college student who is brought in to the Emergency room from the scene of a car accident with deformity, swelling and tenderness of the right foot with no paresthesias and right pedal and posterior tibial pulses are full. He has not lost consciousness, has no abdominal or head trauma, and has only two abrasions on his left leg. X-ray examination of the right femur reveals a comminuted fracture of the midshaft portion of the bone, with dorsal displacement and a small amount of overriding evident. A Steinman's pin is inserted into the distal femur and Mike is placed in balanced suspension traction using a Thomas splint and Pearson attachment and 20 LB of weight. He is then transferred to the orthopedic unit with the following orders:

DAT
VS q1h x4 then q4h
Morphine 10-15mg IM q3-4h PRN
TEDS
Incentive spirometer q1h
X-ray in AM

You are responsible for admitting Mike to the unit. He is placed in a 4 bed ward and appears alert and fairly comfortable, but overwhelmed by all that has happened to him in the past few hours. Because change of shift has just taken place, you will have the next eight hours to assess Mike's situation.

1. Outline nursing action appropriate to the care of a patient recently placed in balanced suspension.

In caring for the patient in traction, you also must be responsible for ensuring effectiveness of the traction apparatus if healing is to occur.

2. Describe nursing actions that will contribute to the proper functioning of the traction.

Twenty-four hours after Mike is admitted, you are doing a routine vital sign and extremity check when you not that his respirations have increased from a normal of 18 to 46, and his pulse is increased from 88 to 120. His blood pressure has not altered significantly and he is not experiencing chest pain or dyspnea but he is apprehensive.

3. Outline nursing actions that would be appropriate now.

The physician orders a number of diagnostic tests, the results of which are as follows:

Chest x-ray negative
Lung scan - no evidence of pulmonary emboli
Hematocrit 39.4% (previously 45%)
ABG
pH 7.42
pCO 31
pO 49
O Sat 85%

Although the concrete evidence is minimal, the physician suspects fat emboli and orders the following:

O at 4L per nasal specs
IV 2/3 1/3 at 100ml/h
Dexamethasone 5mg IV now
Dexamethasone 4mg q6h IV
ABG and Hct in AM

Within several hours, Mike's respirations decrease to 24, his temp to 38 and his pulse to 92. He shows no signs of respiratory distress or confusion. For the next two days Mike is observed closely and then his dexamethasone is tapered and stopped. In addition to observing for fat emboli in the patient with a fracture, complications of immobility need to be prevented.

4. Suggest nursing actions that can decrease the risk of complications.

Mike has been in balanced suspension for six weeks. His major concern has been the fact that he is losing a semester of school work. On rounds this morning, Mike's physician told him that the most recent x-ray films of his leg showed sufficient callus formation to allow for the application of a full leg cast. Mike is excited at the prospect of coming our of traction after so many weeks. He starts talking about getting up on crutches, going home and asking lots of questions about the cast application and what activities he will be allowed.

5. Describe what you would do to prepare Mike for the cast application.

Mike is transferred back to his room following the application of his cast. Nursing intervention at this point is geared toward ensuring proper drying of the cast and preventing complications.

6. In order to accomplish these goals, what would you do?

The morning after Mike's cast is applied, he tells you that the cast feels tight over his foot. When you check, the right foot appears slightly swollen compared with the left foot. He asks if he can have something for pain.

7. At this point, what might you do in an attempt to resolve Mike's concerns.

Two days after Mike's cast is applied, he goes to physical therapy for the first time and gradually becomes accustomed to the parallel bars. The following day, he begins to use crutches using a non-weight bearing gait.

8. In order to assist Mike in learning to use crutches safely, what would you do?

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NURS 203 CASE STUDY #5

Case History

Mrs Sara Hamilton, 50 years old and obese, was admitted with sero positive nodular rheumatoid arthritis. Her right knee is swollen, painful and warm to the touch. In addition, her left hip is painful with limited movement.

Past Medical History

Mrs Hamilton was first diagnosed with rheumatoid arthritis 10 years ago. Her current exacerbation began about 5-6 weeks ago. Mrs Hamilton is currently taking Entrophen 650 mg (6 tabs qd), Immuran 100mg qd, Tylenol #3 PRN. In the past Mrs Hamilton has taken Clinoril, Indocid and Motrin but GI upset was a continuing concern with these medications.

Socioeconomic History

Mrs Hamilton is a housewife who has been divorced for eight years. She lives with her 17 year old daughter in a bungalow that has twelve steps to the laundry room. Mrs Hamilton is responsible for "keeping house" as her daughter does not "help out much". Mrs Hamilton has one married daughter who lives in Leduc and visits frequently. She enjoys sewing, embroidery, and watching TV.

Hospitalized Status

Mrs Hamilton is booked for a total knee replacement. Pre-op orders include:

- Chest x-ray
- CBC
- Crossmatch for 2 units packed cells
- X-ray right knee
- Clip and scrub
- Immuran 100mg qd
- Ancef 1g on call to OR

After surgery Mrs Hamilton returns to the unit in stable condition. Estimated blood loss during surgery had been 800ml. Post-op orders include:

CPM in AM
X-ray in AM
Up partial weight bearing with crutches
Zimmer splint when up
PCA as per orders
Transfuse with 1 unit PC tonight
Hgb in AM
Heparin 5,000 units SC q12h
Ancef 500mg q12h X24 hours

1. Describe immediate post-op care for Mrs Hamilton.

2. Outline nursing responsibilities related to the administration of the unit of packed cells.

Mrs Hamilton complains of fever, chills, nausea and flank pain about 45 minutes after the initiation of the transfusion.

3. Describe immediate nursing actions.

4. Describe ongoing post-op care and discharge teaching for Mrs Hamilton.

Eighteen months later, Mrs Hamilton is admitted for a left total hip replacement. Pre-op care was similar to that for Mrs Hamilton's total knee replacement. However, this time when Mrs Hamilton received her Ancef pre-op she began experiencing urticaria, puritis, diaphoresis and dyspnea.

5. Describe immediate nursing interventions.

6. Outline post-op care and discharge teaching for Mrs Hamilton.